

U.S. Mines Bureau

DEPARTMENT OF THE INTERIOR

FRANKLIN K. LANE, SECRETARY

BUREAU OF MINES

VAN. H. MANNING, DIRECTOR

THE MINING INDUSTRY IN THE TERRITORY OF ALASKA
DURING THE CALENDAR YEAR 1915

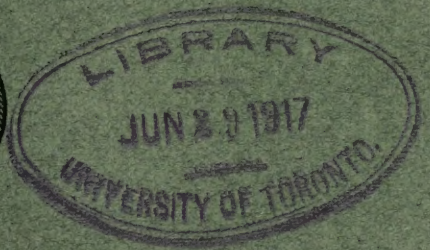
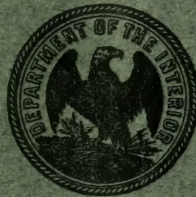
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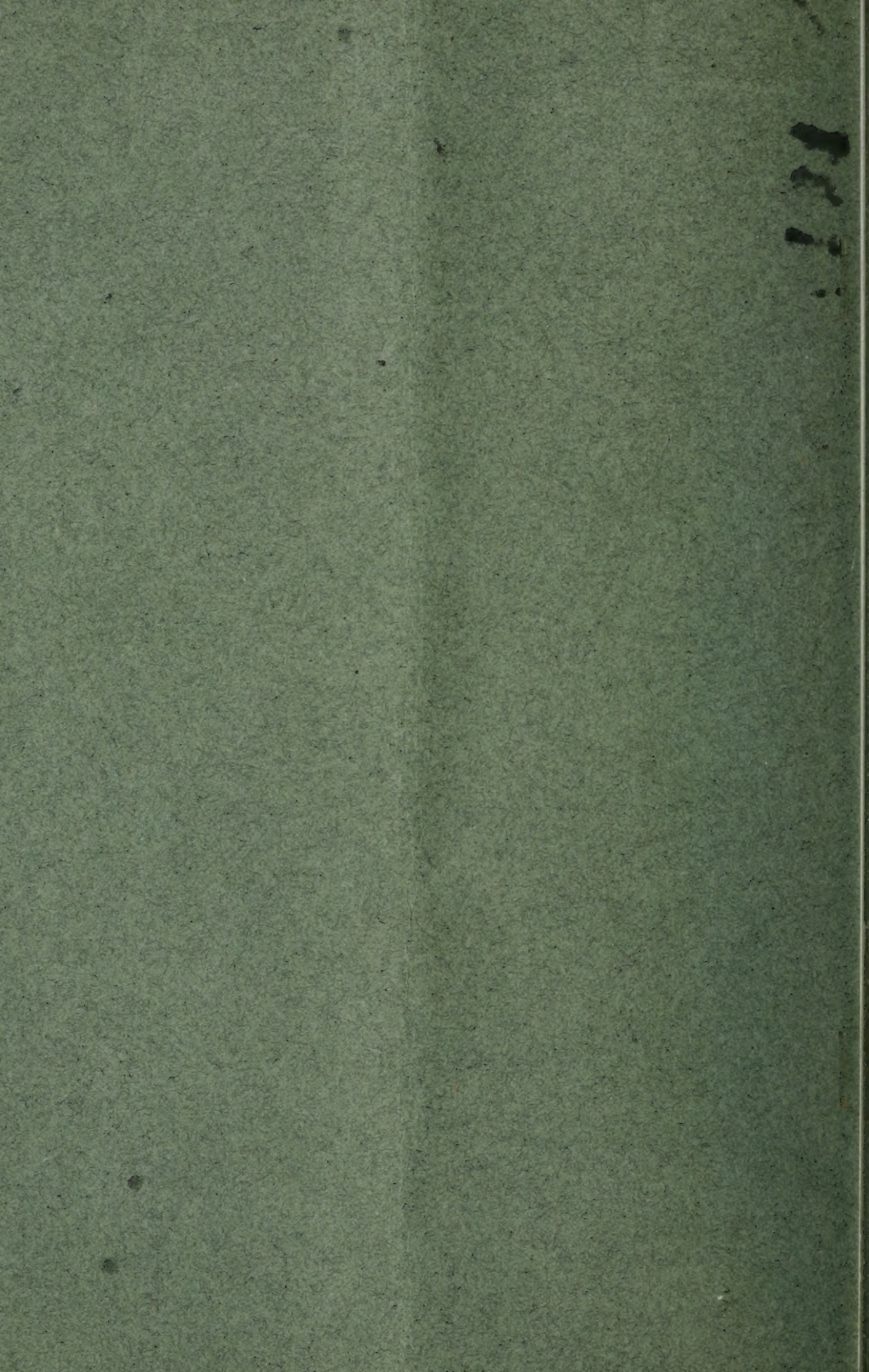
SUMNER S. SMITH

United States Mine Inspector for Alaska

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Bulletin 142

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BY

SUMNER S. SMITH

United States Mine Inspector for Alaska



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DEPARTMENT

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THE MINING INDUSTRY IN THE TERRITORY OF ALASKA DURING THE CALENDAR YEAR 1915.

By SUMNER S. SMITH.

INTRODUCTION.

Mine inspection in Alaska by the Federal mine inspector was somewhat handicapped during 1915, the inspector having to spend a large part of the summer and fall in examining the Matanuska coal field in connection with the designation of the Government reservations and the leasing units in that field. However, in addition to this work, the mines in southeastern and southwestern Alaska were inspected by both Federal and Territorial inspectors, a considerable number of men near the Federal inspector's office at Juneau were trained in first aid to the injured and in the use of mine rescue apparatus, the mines of the interior and of Seward Peninsula were inspected by the Territorial inspector, and a suit was brought in the name of the Territorial inspector for the nonreporting of serious accidents under the Territorial inspection law.

The work of the Federal inspector was handicapped also by a lack of field assistants. This condition is likely to be serious, as preparations have been made for opening the Matanuska, Bering River, and Nenana coal fields, and a number of permits granting the free use of 10-acre tracts in other fields throughout the Territory have been issued. The need of a comprehensive inspection law and experienced engineers to safeguard the opening of coal mines by operators who are not familiar with coal mining and are using inexperienced help is obvious.

NEW GOLD-MINING DISTRICTS.

The only new gold-mining district that has seemed to give promise of a definite future is the Tolovana, although operations there have not been extensive enough to indicate its life with certainty. About \$60,000 in placer gold was produced during 1915. The camp is northwest of Fairbanks and is reached in winter by a road 55 miles long from Olnes. In the summer the road serves as a pack trail, or the trip may be made up the Tolovana River.

The Nelchina, Chisana, and Wade Hampton districts, which showed considerable prominence in 1914, have all proved disappointing. The production in the Nelchina and Wade Hampton districts was negligible; in Chisana about \$135,000 in placer gold was recovered, but the expense of freighting to this district is so high that the net profit was small.

During the fall, reports of new discoveries on the Innoko were frequent, but no authentic news was available at the time this report was written.

MINERAL PRODUCTION.

The figures on mineral production collected by the United States Geological Survey ^a and the Customs Division of the Treasury Department indicate that the past year was the most productive since 1906, when the placers of the interior and of Seward Peninsula were at their height, the total for that year being \$23,378,428. The value of the minerals mined in 1915 is about \$32,800,000, as compared with \$19,064,963 for 1914.

The high price of copper has been a great stimulus to mining and is largely responsible for the increased output. In 1914 21,450,628 pounds of copper was mined, valued at \$2,852,934; in 1915 about 86,500,000 pounds was produced, valued at \$15,139,129. The gold production also increased in 1915, when the value was about \$16,700,000, against \$15,764,259 for the output of 1914. This is the largest gold production since 1912, when the output was valued at \$17,145,951. As the production of silver is incidental to gold and copper mining, this also increased. About \$540,000 worth of silver was mined in 1915, against \$218,327 worth in 1914.

The mineral output of the Territory for the calendar years 1913 and 1914, as compiled by the United States Geological Survey, ^b is as follows:

Mineral output of Alaska, 1914 and 1915.

	1914		1915		Increase in 1915.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold.....fine ounces..	762,596	\$15,764,259	807,966	\$16,702,144	45,370	\$937,885
Silver.....do.....	394,805	218,327	1,071,782	543,393	676,977	325,066
Copper.....pounds..	21,450,628	2,852,934	86,509,312	15,139,129	65,058,684	12,286,195
Tin.....tons of metallic tin..	104	66,560	102	78,846	c 2	12,286
Antimony.....tons of crude ore..	.....	.....	833	74,000	833	74,000
Lead.....short tons..	28	1,344	437	41,118	409	39,774
Coal.....do.....	.....	.....	1,400	3,300	1,400	3,300
Marble, gypsum, petroleum, etc.	.....	162,242	.....	272,299	.....	110,057
Total.....	.....	19,065,666	.....	32,854,229	.....	13,788,563

^a Brooks, A. H., Mineral resources of Alaska, 1915: Bull. 642, U. S. Geol. Survey, 1916, p. 17.

^b Brooks, A. H., page cited.

^c Decrease.

The output of other minerals, including tin, antimony, marble, gypsum, coal, and petroleum in 1915 had a value of about \$470,000, compared with \$222,802 in 1914.^a

PLACER GOLD.

The output of placer gold showed a slight decrease over 1914, which was partly due to the partial exhaustion of the placers, but also to the fact that many of the operators owning ground tributary to the line of the Government railroad prefer to await the completion of the road, when comparatively cheap coal may be obtained, rather than to pay the present excessive price for wood. As the cost of fuel for thawing frozen placers constitutes a large part of the total mining cost, the delay is warranted. The output of placer gold for 1915 is valued at \$10,480,000, as compared with \$10,730,000 in 1914.^b

More than 30 gold dredges were busy in the summer of 1915, and the construction of several new ones was started. The value of the output from dredging declined slightly, being \$2,330,000 in 1915 and \$2,350,000 in 1914.

LODE GOLD.

Greater activity in lode gold mining at Juneau is responsible for a marked increase in production, the total output for the Territory being valued at about \$6,070,000 in 1915 as compared with \$4,863,028 in 1914. More than 30 lode gold mines were in active operation during the year, though the bulk of the gold came from the Juneau district. In that district one new mill treating 6,000 to 8,000 tons of ore daily has been completed, and construction on another of similar size has started. Several small mills were constructed in the different districts, and two cyanide plants were erected.

COPPER.

The increased price of copper led to a forced production from all of the operating copper mines; to the resumption of work at several mines which had been closed for the past few years, putting them again on the shipping list; and to the prospecting of other numerous deposits.

There was practically four times as much copper produced in Alaska in 1915 as in 1914, and the value of the 1915 production was nearly five times as much as that of the 1914 production. The output came from seven mines in the Ketchikan district, four on Prince William Sound, and three in the Chitina district. Enough exploration work has been done on other claims in these localities to insure a

^a Brooks, A. H., work quoted, pp. 16, 17.

^b Brooks, A. H., work quoted, p. 21.

number of additional mines. With a number of excellent prospects in the Broad Pass district, the opening of the Alaskan coal fields, and the construction of the Government railroad connecting these parts of the Territory, this branch of the industry should have a steady and assured growth.

TIN.

Two districts, the Manley Hot Springs in the Tanana Valley and the York district on the Seward Peninsula, were exporters of tin concentrate. Though there was some exploration work done for lode tin, the entire product shipped was placer. At the Hot Springs the tin is caught in the sluice boxes while the auriferous gravels are being washed. At York three dredges, one working exclusively for tin and the other two for tin concentrate and gold, are responsible for the output. Some 200 tons of concentrate was produced during the year. The value of the tin was about \$78,000.

ANTIMONY.

As in the case of copper, the high price of antimony led to increased production. Whereas a few years ago the smelters refused to accept small shipments of antimony ores except at a prohibitive figure, the ore buyers are now taking all they can obtain and are asking for more. The total production amounted to approximately 800 tons, 700 of which came from the Fairbanks district and the rest from the Seward Peninsula, the total being valued at about \$74,000.

MINERAL FUELS.

About two dozen permits granting free use of 10-acre tracts for two years have been granted, and a small quantity of coal has been produced. At several points on Cook Inlet mining was started in a small way to supply the demands of the new towns along the right of way of the Government railroad.

A topographic and subdivisional survey was made of the Bering River and Matanuska coal fields, and the fields were subdivided for leasing.

The usual small amount of oil was produced in the Katalla field and was refined at Katalla, but, with this exception, nothing was done toward the production of oil elsewhere, although seepages were reported on the Arctic coast and along Cook Inlet.

WORK OF THE FEDERAL MINE INSPECTOR.

The inspection work of the calendar year covered the mines in Ketchikan, Juneau, Prince William Sound, and the Copper River districts. In the early spring, the Federal inspector spent considerable time in the Juneau district training the miners in first aid to the injured and in the use of mine rescue apparatus.

An examination was made of the Matanuska coal field to designate the Government reservations and the leasing units in that field. The field work, together with the writing of the report, consumed three months in the summer and fall and prevented the inspector from making the usual trips to the interior and to Seward Peninsula.

Suit for not reporting serious accidents was instituted against one mining company by the Alaskan Territorial inspector, under the Territorial mine-inspection law.

Letters have been written to the operators throughout the Territory requesting their assistance in compiling data on all accidents, and most of them have given their cordial support. Printed forms for the reporting of individual accidents have been mailed to the operators with the request that they fill out the statements required by the Territorial law and return a report promptly to the inspector immediately following an accident.

The Territorial legislature, at the 1915 session, authorized the Federal inspector in the absence of the Territorial inspector to enforce the provisions of the new Territorial mining act.

HEADQUARTERS.

The headquarters of the Federal inspector are in the courthouse at Juneau, where he occupies, through the courtesy of the Department of Justice, the grand jury room when that body is not in session. This room is inadequate for the present needs of the office and permanent quarters should be provided at an early date, especially in view of the additional work that will be thrown on this office by the opening of the coal mines throughout the Territory.

CLERICAL ASSISTANCE.

During the year Congress made the necessary appropriation for a clerk for this office, and R. A. Dye was appointed to the position. This appointment has taken from the inspector the burden of routine work in the office and allowed him more time for inspection trips. Mr. Dye also trains classes of miners in first aid to the injured, thus relieving the inspector of these duties.

The Bureau of Mines has furnished the inspector with desks and files for the care of records and correspondence.

NEEDS OF OFFICE.

The work of inspection is still handicapped by the lack of field assistants, adequate office room, and funds for traveling expenses and equipment. One inspector traveling continuously can not inspect all the mines of the Territory during one year. To cover the Territory

properly four assistants are needed. With this number of men, the mines of the Territory could be inspected several times annually, and if orders were issued to any mine to make changes to conform with the law, the inspector would have time to return to it to ascertain whether the changes had been made.

MINING EXPERIMENT STATION.

The act of Congress authorizing the establishment of mining experiment stations in the United States and Alaska should prove of almost incalculable value to this Territory. The miner has been the pioneer of the frontier, and the markets developed by the communities founded on his discoveries have led to permanent settlements and the development of other resources. The new Government railroad, for many years to come, will be dependent on freight carried for the mining industry, and any effort to assist the miner will result in additional traffic for the railroad. Alaska's future lies chiefly in her mines.

The establishment of an experiment station in Alaska will greatly assist in the extension of its mining and metallurgical industries. Many promising prospects can not be developed because of the difficulty of raising funds on account of the uncertainties regarding the best methods of concentrating and subsequently treating more or less complex ores, the cost of transportation of supplies and of concentrates, and the best places for smelters.

There is a great demand by the Alaskan prospector that the Government make free assays, more especially as it has been found that custom assayers do not obtain enough work to warrant their continuing in that business. However, as the act establishing the Bureau of Mines does not authorize such free assays, the most that can be done for the prospector is to make mineralogical or qualitative determinations. It is probable that the establishment of a mining experiment station will increase the business of custom assayers, so that in this way local assay offices will be established and the prospector will be benefited thereby, for the cost of individual assays is small when considerable business is available.

NEW TERRITORIAL LAWS.

At the spring session (1915) of the Territorial legislature seven laws and amendments to laws affecting the mining industry of the Territory were passed. The eight-hour law was amended to include all underground workers; an act to supplement the mining laws of the United States and a laborer's lien act were passed; the Territorial inspector's salary was raised; the mine-inspection act was amended; and a compensation act and an act compelling the filing of grubstake contracts were passed.

As regards the eight-hour and compensation acts, no officials were designated to see that the provisions of the laws were carried out. Consequently these laws have been followed only where it suited the convenience of the operator.

A conspicuous example of a violation of the eight-hour act was in the Fairbanks district, where the wages were \$5 per ten-hour day, and board. When the law became effective the operators paid the same scale per hour, making the wages \$4 per eight-hour day, and board. The men struck, and a compromise was reached whereby the operators paid \$5.50 per ten-hour day, and board. The work continued at that figure throughout the rest of the season.

The compensation law provides for compensation only when the operator has funds to cover the amount. There is no official having authority to enforce payment of compensation, so that the injured employee receives nothing unless the operator chooses to pay him or unless the employee brings suit. If an employee is injured in the mine of an operator who is weak financially, neither the employee nor his dependents are likely to receive anything.

PROSECUTIONS FOR VIOLATIONS OF MINING ACTS.

Under the Territorial inspection act (Session Laws of Alaska, 1913, ch. 72, sec. 5) suit was brought in the name of the Territorial inspector against the superintendent of a mining company for not reporting serious accidents. The company is mining a deposit of copper ore which has a graphitic slate for a hanging wall. This slate contains much carbonaceous matter and generates considerable gas (methane). About two years ago the company began driving raises in the hanging wall to obtain waste for filling the stopes, and these raises gave off sufficient methane to cause local explosions. Several men were burned, but no reports were made to the inspector. The superintendent was then notified that the inspector considered such accidents serious and that they should be reported under the law. The superintendent was also instructed to obtain safety lamps and have all raises tested for gas by one of the bosses before allowing the men to work there. The lamps were obtained, but the testing, if done at all, was done in a haphazard manner by the miners instead of by the mine officials. On October 18 the surveyor and assayer and his assistant started up a waste raise to measure it. They ignited a pocket of gas at the top of the raise and were blown down to the gangway. The surveyor's hands and face were seriously burned. The assistant's hands and face were also severely burned and his ankle so badly injured that he was in bed at the time of the inspector's visit, three weeks after the accident. Neither accident was reported, in spite of the request that the superintendent report such accidents. A charge of not reporting the accident was brought against the super-

intendent and the case tried in the United States commissioner's court at Valdez on November 26. As the Territorial mine inspection act does not define a serious accident and the attorney for the defendant pleaded that a serious accident was synonymous with a serious injury, the court ruled that the defendant was entitled "to the benefit of the doubt" and dismissed the case "on the evidence as presented," although both Federal and Territorial inspectors testified that, in their opinion, the accident was serious.

Evidently the mine-inspection law should define a serious accident. Effective prevention of accidents requires a study of the causes, and it is obvious that all possible measures should be taken to obtain data on accidents that involve great hazard, even though, by chance, no injury may result.

COAL LEASING ACT.

During the year preparations were completed for opening the Bering River and Matanuska fields under the leasing act of October 20, 1914 (38 Stat., 741). Subdivisional surveys were made by the General Land Office during the summer of 1915. The fields were later examined by engineers of the Bureau of Mines and the General Land Office, who, in accordance with the leasing act, indicated the areas to be reserved to the Government and divided the fields into leasing blocks or units.

The full text of the leasing act and of the regulations thereunder, copies of the leases and permits and applications therefor, descriptions of the leasing units, and a large amount of information regarding the fields and their development are given in a report entitled "Regulations governing coal-land leases in the Territory of Alaska," issued by the Secretary of the Interior.^a

COAL FIELDS.

Through the work of the General Land Office and the Bureau of Mines, Government reservations were designated in the Bering River and Matanuska fields. These reservations were intended to cover such ground as would provide coal for Government use, protect the public from individuals attempting to monopolize coal lands or extort exorbitant prices for coal, and still offer equally good areas in the best-known parts of the fields for exploration by private enterprise.

The leasing units were laid out in comparatively small blocks, which can be worked individually or combined into larger tracts up to the maximum acreage permitted by law. Careful attention was given to the amount of probable coal of workable thickness in each of these areas, the relationship of the area to possible transportation

^a Copies of this report may be obtained free by applying to the Secretary of the Interior, Washington, D. C.

lines, the quality of the coal, the topography of the country, and the general conditions affecting mining.

The future of the Alaska coal fields is still somewhat problematical. Along the entire coast the output will come in direct competition with California oil, the coals of Oregon, Washington, and British Columbia, and with hydroelectric power. Both the Bering River and the Matanuska fields contain high-grade bituminous coal suitable for coking and for use in the Navy, and the Nenana field contains an excellent lignite suitable for power or domestic uses or as a powdered fuel in reverberatory furnaces.

Coals from other States on the coast have not proved satisfactory for use by the Navy, so that for naval use Alaskan coals will have to compete chiefly with Appalachian coals, shipped from Atlantic ports by way of the Panama Canal. The domestic market is assured, but it is doubtful whether Alaskan coals can compete successfully in the home markets of the British Columbia or Washington coals. Possibilities in the manufacture of coke for the smelting industry appear promising. At present the large output of copper ore is all shipped to points outside the Territory for treatment. Fairly cheap coke would be an inducement for the erecting of local smelters and ore samplers, which, in turn, would result in the development of many metal mines now idle on account of the excessive cost of shipping ore to outside points.

In the Fairbanks district wood costs \$12 to \$16 a cord, and is hard to obtain at any figure. There still are, in that district, many acres of frozen auriferous gravels that must remain unworked until mining costs are reduced. Cheap coal, and the product of the Nenana field would be excellent for this purpose, would materially lower these costs, as the cost of fuel is a considerable part of the total cost in mining frozen ground. These mines should supply a ready market for the Nenana coal, which should also displace wood on the river steamers and might even be shipped to Nome and compete with other coals now retailing there at about \$10 per ton.

GOVERNMENT RAILROAD.

During 1915 the Government took over the old Alaska Northern Railroad from Seward, and undertook the construction of a standard-gage railroad from the coast at Seward to Fairbanks with a branch line up the Matanuska River to the coal fields.

Work was started at Ship Creek on the east side of Knik Arm, a branch of Cook Inlet, and the town of Anchorage was established. Rails were laid for about 30 miles north of Anchorage, and the rehabilitation of the road out of Seward was begun. During 1916 grading will be undertaken at Nenana, at the junction of the Nenana

and Tanana Rivers, toward Fairbanks, and up the Nenana toward Broad Pass. The old line from Seward to Kern Creek will be rebuilt, grading from this point to Anchorage started, the main line continued from the end of the present construction toward the Susitna River, and a branch built up the Matanuska River at the head of Knik Arm to the coal fields.

LABOR.

During the year the supply of labor was considerably in excess of the demand, owing to the large influx of men seeking employment on the Government railroad and the prospect of the coal areas being opened for leasing. Many of those who did not find employment at once returned to the States. A large number, however, took up homesteads, and others scattered to the towns throughout the Territory.

The eight-hour law, which went into effect at the middle of the season, threatened to cause considerable trouble, as many operators continued paying the same hourly schedule, thus reducing wages \$1 a day, as the men, up to that time, had been receiving \$5 a day and board for a 10-hour shift. Small strikes at several of the interior camps resulted in compromises. At Nome most of the operators continued paying \$5 a day and board, though they cut the hours from 10 to 8. In the Ruby district no definite settlement was made. Some of the operators continued at one rate and some at another, and others suspended mining altogether. At Fairbanks the men struck and a compromise was effected, the men going back to work on the 10-hour basis. The operators granted an increase of 50 cents a day, so that the men get \$5.50 a day and board. This arrangement was in open violation of the Territorial law, but no official has been appointed to enforce the law, and there have been no prosecutions for its violation.

Generally the scale of wages is the same as in 1914, miners on the coast receiving \$3 to \$4 a day and boarding themselves, and those in the interior and on the Seward Peninsula receiving \$4 to \$6 per day and board. On the dredges the scale is from 50 to 75 cents an hour and board. Living conditions remain about the same. The companies operating on a fairly large and permanent scale provide good living accommodations; those whose operations are more or less temporary provide as little as possible.

FIRST-AID AND MINE RESCUE TRAINING.

More interest has been shown in first-aid and mine rescue training than ever before. The Kennecott and Alaska-Gastineau mining companies have installed oxygen mine rescue apparatus, and the Tread-

well company has trebled its equipment. A number of men have been trained in the use of this apparatus and at the Treadwell a safety engineer has been appointed. His duties are to inspect the mines underground, train the men in first-aid and mine rescue work, note that the apparatus is always available and in good working condition, see that there is first-aid material at the proper places underground, and investigate any possible changes underground that will lead to greater safety. He is also a member of the safety committee that investigates and makes a report on each accident. The company has begun the publication of a quarterly magazine entitled "The Gold Bar," which contains articles on safety and gives lists of accidents. A book of safety rules has also been published by the company for the use of the miners, which includes directions regarding the shafts and cages, stoping and development work, the use of explosives, precautions in training, and general safety rules for underground work and work in ore mills. The directions are reprinted herewith.

FOREWORD.

TO THE EXPERIENCED MAN.

Mining is a business that is hazardous under the best conditions.

You are constantly surrounded by dangers, many of which you are perhaps disregarding daily, because you have become familiar with them and hardened to them. But you must remember that any accident caused by carelessness on your part may not only hurt you, but may also injure or possibly kill one of your fellow workers, in spite of all the precautions he may have taken for his own safety. You have, therefore, not only your own life and limbs to take care of, but you are responsible for the safety of all the men working near you. Do not, just because you have been working as a miner for many years, take chances that you would be the first to condemn in anybody else. You may not know that carelessness is more dangerous underground than ignorance, and that you, the miner of 5 or 10 or 20 years' experience are more to be feared than a new man, for you have become hardened to dangers and are willing to take chances that a new man would be afraid to take. Do you realize that by far the great majority of "accidents" are caused by carelessness on the part of experienced men like yourself, and that it may be your turn to-morrow or next week? The only way that you can reduce the dangers around you is to use extreme care in doing your work and to urge every man working near you to do the same.

TO THE INEXPERIENCED MAN.

If you are inexperienced, you should apply yourself to the task of learning to protect yourself and others. You can get this knowledge by constant observation and by asking questions of those who know. Don't be ashamed to ask questions. After you learn something of value, don't forget to use it. When you become an experienced miner, don't take chances just because you have become experienced. Remember that experienced miners are being killed or injured because they take chances that a new or inexperienced man would be afraid to take.

The object of the following rules is to obtain the greatest possible safety for all, and it is your duty to take sufficient time to make the examinations required

by them to guard against any dangers from accidents in the mine or its workings. The best mine in the world, if worked by careless or indifferent miners, will have more accidents than the worst one that is worked by miners who are always thinking of preventing accidents to themselves and their fellow workmen.

The important part of any rule is the spirit of it. This is gained by understanding the wisdom and necessity of the rule, and not by mere obedience because it is a rule. No rule seems hard when you see that it is wise—worked out from experience made necessary by existing conditions.

The object of a rule is not to abridge the rights of anyone, but to point out the path which experience has taught is the wise one to follow.

SAFETY FIRST.

Any flagrant or habitual disregard of these rules will result in your discharge.

SHAFTS AND CAGES.

1. There shall be no pushing or crowding around collar of shafts or at stations, in loading or unloading cages. There shall be no "horseplay" on the cages.

2. The cage man, stope boss, or other man delegated to load or unload cages, when the shafts are being hoisted or lowered, shall see that the cage gates are securely closed before giving the signal to move the cages, and shall be responsible for their closing.

3. No person but the cage man, stope boss, or other man regularly delegated to this duty shall operate the pull-bell signals.

4. No person shall use the call or flash signal system unless he is certain that he knows and understands same.

5. In lowering or hoisting shafts there shall be no lighted lamps, candles, or torches on the cage except the cage man's, and that shall be placed high enough to clear the heads of the men.

Smoking on the cage while shift is being lowered or hoisted is forbidden.

6. No man shall leave the shaft or any station without first seeing that the bar or chain is properly placed in position to prevent anyone from walking into the shaft opening.

7. Men shall not be hoisted or lowered at a greater speed than 800 feet per minute, and cage must commence to slow down when within 100 feet of the shaft collar or of the bottom bulkhead or sump covering.

8. Men shall not ride on the skips in vertical shafts *under any circumstances* unless the skips have their bonnets in place.

9. Men shall not try to mount or leave skip or cage while same is in motion or after the signal to move has been rung.

10. No tools shall be carried on the cage when shift is being handled. Tools, steel, and other small material shall not be lowered or hoisted except when placed inside skip or cage and made safe.^a

11. No explosives shall be carried on the cage when shift is being handled. Powder and primers shall not be handled on the cage at the same time.

12. Drills, timber, or other material shall not be placed within 10 feet of any shaft opening, head of raise or winze.

13. No man shall, *under any circumstances*, cross a skip or cage compartment unless the cage or skip is being held at the point of crossing.

14. When lowering or hoisting tools, timber, or other material that is long enough to project above cage or skip, same material shall be securely lashed to the hoisting cable or otherwise secured.

^a Sec. 16, h. 1., Alaska Code, 1915.

15. No person shall ride upon any cage, skip, or bucket that is loaded with tools, timber, powder, or other material, except for the purpose of assisting in passing these through the shaft; except that on double-deck cages, riding on the deck unoccupied by tools, timber, or other materials is permissible.^a

STOPING AND DEVELOPMENT.

1. Each man must examine his working place on going on shift, and if same is not safe he must make it so before proceeding to work.

This examination should particularly cover:

- Loose or scaling rock;
- Missed or cut-off holes;
- Loose powder in muck pile;
- Stagings;
- Ladders;
- Machine bars.

If conditions are such that he can not make his working place safe, he must immediately report same conditions to his foreman or shift boss.

2. No man shall take for granted that an unfinished set-up, or any unfinished work, is safe. Conditions may have changed since departure of previous shift.

3. In returning to work after springing a hole, or after any sort of blasting at or near your working place, make just as careful an examination as though you were coming on shift.

4. If a set-up is to be left in a raise during any near-by blasting, always slightly loosen the jack of your machine bar.

5. Keep your ladders and stagings free from loose rock.

6. When working in a raise, be sure that your steel and tools are securely placed on your staging.

7. Before dropping drill steel down a raise be sure to give ample warning.

8. Do not climb a ladder under a man with a load of steel.

9. Machine men must see that their machines, hose, and tools are moved a sufficient distance to escape injury from blasting or from falling ground.

10. Be sure that your air-line valve is closed before taking off your gooseneck or other hose connection.

11. Before turning on air to clear an air line, be sure that no one is near the open end of same.

12. When working in any place which is being driven to connect with any other working place, do not blast when same face is within 20 feet of the connection before having sent word to warn all men to keep away from the point at which the connection is to be made.

13. Do not go into a stope or bulldoze chamber until the same is reasonably clear of smoke.

14. When barring down loose ore or rock, always keep a sharp lookout for missed "bulldozes," or any other loose powder.

15. When barring down, proceed with caution—be sure that the ground above you is safe.

16. Never start setting up a machine until the place of setting up and the approach to the same are well trimmed down.

17. Keep ladders and platforms in the manways clear of loose rock.

18. Do not place steel or tools where they may fall down a raise.

19. Do not drop steel down a drill pipe unless you have a man at the bottom of same.

^a Sec. 16, h. 1., Alaska Code, 1915.

20. If you see a fellow workman doing something dangerous do not laugh at him; give him advice—and a lift.

21. Do not misuse or abuse tools. Proper tools will be furnished for all work. Using a wrench as a hammer, a shovel to bar down with, etc., are misuse. Take care of tools.

EXPLOSIVES.

1. Miners engaged in bulldozing or using powder in any way *must never store primers and powder together*, even for a short time. Places will be provided for their *separate storage*.

2. *Never carry or transport powder and primers together*. Always make a special trip with primers and use extreme care in handling both primers and powder.

3. Fuse at this mine burns at a rate of not less than 23 seconds per foot. In blasting holes, no fuse must be used of a length shorter than 5 feet.

4. All powder and primers not used must be returned to the magazines and not left lying around the mine.

5. Never take a lighted lamp or other open light into a powder or primer magazine.

6. Do not smoke in a magazine, or while handling explosives.

7. After spitting fuses, always stay within hearing distance to count the number of shots, and carefully note the number of missed holes, if any.

8. In loading holes, no instrument other than a wooden loading stick shall be used.

9. All holes must be well tamped so that no powder is exposed.

10. Before lighting holes be absolutely certain that all men who must pass this point on their way from work have already passed.

11. No man shall approach a missed hole within 20 minutes after spitting the fuse.

12. When blasting on going off shift always report missed holes at your mine office so that the on-coming shift may be notified. If three shifts are working, notify the on-coming shift directly.

13. Do not use a pick as though it were a sledge hammer—scratch with it; there may be loose powder or a primer in any muck pile.

14. Never start drilling in a face in which there is a missed hole. Blast the missed hole.

15. Never try to pick powder from a missed or cut-off hole. Blast it, and be sure that all powder is well covered before lighting.

16. Never start a hole in the "gun" of a previous hole.

17. Never spring a hole on going off shift.

18. Never spring a hole without first clearing same of dust or mud.

19. Never spring a hole with more than a single primer.

20. For springing holes the shortest permissible fuse shall be 36 inches.

21. Springing holes is a practice that should be discouraged in so far as is possible.

22. Missed holes within 10 feet of a set-up or in loose ground must be blasted immediately.^a

23. All blasting and bulldozing shall be under the direct supervision of the stope boss or some other regularly delegated person. He shall see that all is in readiness and shall be the person to give the signal for lighting.

24. Always cover your bulldozes with fine dirt so that there is no exposed powder.

^a Alaska Code, 27, i.

SANITATION.

1. Scraps and refuse from lunch buckets must not be thrown at random in the mine, but must be disposed of as directed by mine foreman.
2. You must use sanitary appliances which are provided.

TRAMMING.

1. On going on shift and when changing chutes make a thorough examination of your working place.
2. Do not go into a chute that is hung up. Blasting poles are furnished to place powder in position to blast rock down.
3. Be sure to warn in all possible avenues of approach before blasting in a chute.
4. Examine your working place carefully each time after having blasted.
5. No fuse shorter than 36 inches shall be used in blasting in a chute.
6. Do not start drawing until smoke has cleared away so that you can see clearly the condition of your working place or see any powder that may not have exploded.
7. Before drawing a large rock be sure to brace your car so that it will not be tipped over.
8. Use extreme caution in drawing a chute—know where your hands and feet are; and do not get your bar in such position that it will knock you down if struck by a rock.
9. Trainmen must not ride on the front end of a train or between the cars.
10. Persons not engaged on ore trains must not ride on them.
11. When rounding a curve or running through a foggy drift move your train slowly and sound your gong.
12. Do not jump on or off a moving train.

SINKING.

1. Always keep your chain ladder within reach.
2. Keep the timbers above you free of loose rock.
3. Do not work above another man, no matter at what distance, unless there is a proper bulkhead between.
4. For shaft firing, the shortest fuse must be 9 feet in length.
5. Before spitting fuses, the blasting signal must be given to the engineer, and no fuse must be lighted until he replies by hoisting the bucket or skip a few inches, and lowering it again.

HOISTING.

1. Engineers must not move a cage or skip until sure of their signal—wait for a repeat if there is any doubt.
2. A uniform code of rules and signals is provided for all shafts.
3. Posted rules and bell signals must be strictly obeyed.
4. Shaft rules and copy of bell-signal code must be posted in each engine room and at each shaft station.
5. Do not go back of or over cables while drums are in motion.

GENERAL.

1. Upon resuming work at points where operations have been abandoned for some time, a thorough investigation should be made as to the condition of walls,

stagings, ladders, timber, etc. This investigation should be directed by the foreman or shift boss in charge, and should be demanded by any employee.

2. When a boss tells you that you are doing something dangerous, stop doing it. He is responsible for your safety, and knows what he is talking about—that's why he is a boss.

3. Remember that most accidents are caused by neglect of the little things, by disobedience of rules or orders, or by carelessness.

4. Never attempt to go to work when you have been drinking, however little, for then you are in no condition to go underground. Even a slight degree of intoxication that might not be noticed when you get your check is dangerous underground, because the heat or lack of fresh air increases the effect of liquor. Do not hesitate to report any intoxicated man you see working, not only for his sake, but for your own safety.

5. Be careful when around any electrical apparatus or wiring.

6. Do not give a man an electrical shock; a shock that would not bother you might prove fatal to him.

7. Do not misuse the "first-aid" cabinets; they are there for humanitarian purposes, and you may be the next man hurt.

8. Report all injuries no matter how slight, and do not neglect to have slight wounds properly dressed.

9. Do not meddle with any machinery that you are not delegated to care for.

10. Do not deface or destroy signs or other property.

11. Do not meddle with fire apparatus.

12. The use on the railway of push cars, hand cars, or other cars belonging to outside parties is strictly prohibited except on that portion of the track between the sawmill and the electrical repair shop. Cars belonging to the various departments are for department use only, and must not be loaned for other purposes. A car may be obtained, when necessary, from the steward, for handling personal baggage only, between points on the line.

13. Persons other than employees in the performance of their duties are forbidden to ride on the trains.

14. Keep a lookout for trains when crossing tracks.

15. When walking near tracks, keep in the clear at all times.

Persons other than those engaged in track repair are forbidden to walk on trestles where walks are not provided.

MILLS.

1. Wear goggles when using a hammer.

2. Do not stand under a cam shaft or other machinery being lowered from cam floor—stand to one side until it is near the floor.

3. Do not put your hand on top of shoe when under stamp; take hold of sides of shoe neck to straighten shoe.

4. Never poke burlap into boss head when under stamp without pulling top of boss head to one side.

5. When setting tappets do not put your hand between the tappets or hold on top of collar when the next stem is dropping, as the moving stem may catch under the tappet and crush the hand between the collar and girt.

6. When working in the battery do not lower or drop stamp without the parties working in battery giving signal so to do.

7. When at chain blocks always be sure that the sling or chain is in good order before using them.

8. Never put your hand under a stamp when it is being raised with the blocks, as the chain or sling may slip.

9. Never put your foot on the cams to brace yourself when holding a stem out while lowering it into the battery, as you may get your foot crushed.

10. When you hang up the stamps to work in the battery see to it that the fingers set squarely under the tappets, so that no one will get caught by their slipping off.

11. When keys are being driven out of tappet to drop stem into boss head don't hold the hand on the stem, as it will roll the fingers into the top of the tappet and pull the flesh off the fingers.

12. When putting a battery belt on never stand on the bridge between the two pulleys, as the belt may pull the bridge down.

CONCLUSION.

In the preparation of these rules the committee is fully aware that there are many special cases and conditions that have not been covered. The cooperation of every employee is necessary for the proper enforcement of these rules. Bear in mind that a strict compliance with these rules and of other reasonable precautions for safety will result in increased efficiency in your work as well as in a smaller number of accidents.

Recognition of this fact will result in a better understanding between the workman and those in supervision of the work, thereby creating better working conditions. Remember that the workman who advances is the one who takes a lively interest in his work. Many of the most practical ideas have been advanced by workmen actively engaged in their work.

If you have an idea that you think will increase the safety or efficiency of the work do not hesitate to tell your boss or some member of the Safety Committee.

It will be apparent to all that all ideas advanced can not be adopted, but by an intelligent discussion of these matters definite results may be obtained.

FIRST-AID TRAINING.

A first-aid meet was held on July 5, 1915, at Treadwell, which brought into competition a number of teams from the Treadwell underground and surface employees. From these men a team was picked and sent to the competition at the San Francisco Panama-Pacific Exposition. The men representing Treadwell are deserving of the highest praise for their conscientious work in this event. In competition with 25 other teams, coming from all parts of the United States, they tied for fourth place, though many of the other teams were composed of men who had specialized in this work for years and had had the benefit of past experience in many first-aid meets.

As previously stated, R. A. Dye, clerk to the mine inspector, has been training the miners at properties near Juneau in mine rescue and first aid. There is a demand that a man especially trained in such work shall spend a part of his time visiting the mining districts of the Territory, as there are far more men anxious to receive training than this office can handle. When coal mining in the Bering River and Matanuska fields becomes active there will be need of more facilities, possibly a mine safety station, for such training.

MINES AND DISTRICTS.

YUKON BASIN.

The Yukon basin includes the Fairbanks, Tolovana, Forty-Mile, Eagle, Circle, Rampart, Ruby, Iditarod, Manley Hot Springs, Chisana, Koyukuk, Innoko, and Marshall districts.

FAIRBANKS DISTRICT.

Although there was a slight decline in the output of the Fairbanks district, about the same number of men were employed and the same number of mines operated as in 1914. The largest production was made from Cleary, Ester, Fairbanks, Dome, and Vault Creeks and their tributaries. The two principal methods in this district were mining with steam-operated scrapers and drift mining. One dredge was in operation on Fairbanks Creek.

The dredge was an old one and can not be said to have been a success.

The following description of mining operations in the Fairbanks and other districts is taken from the report of the Territorial mine inspector for 1915.^a

PLACER MINING.

Cleary Creek.—Cleary Creek and the section of Chatanika River valley adjacent to its lower course form the most productive placer-mining center of the district. Twenty plants were operated on Cleary Creek during the mining season from Claim No. 8, above Discovery, to No. 17, below Discovery, employing 275 men.

Little El Dorado Creek.—Five plants were working on Little El Dorado Creek during the season, employing 30 men. Most of the plants were operated by partnership agreements. Few men were employed that were not interested as partners.

Dome Creek.—Eight plants were operated on Dome Creek from No. 3 above Discovery to No. 7 below Discovery, employing 48 men. On lower Dome, which is part of the Chatanika River valley, there were two plants on the Niggerhead claim, one on the Shakespeare and one on the Day Dawn Association, employing 50 men.

Vault Creek.—Four claims were operated during 1915, employing 80 men. Three of these were on upper Vault and one on the Oregon Association.

Wolf Creek.—Five claims were operated on Wolf Creek, employing 22 men. This creek is a tributary to Cleary Creek.

Fairbanks Creek.—Four underground placer, three steam-scraper plants, and one dredge were operated on Fairbanks Creek during the season, employing 67 men. The dredge, which is the only one in this district, is operated by the Fairbanks Gold Mining Co. One steam-scraper plant was operated on Alder Creek, a tributary of Fairbanks Creek.

Pedro Creek.—On Pedro Creek several steam scrapers were at work during the season. The Hanot brothers installed a new mechanical scraper with an overhead trolley system. The scraper is loaded by the usual system of hauling

^a Report of Territorial Mine Inspector, 1915, pp. 12-21, 27.

by cable. After the scraper is loaded it is hoisted and carried to the dump box by an overhead trolley instead of being dragged up an incline to the dump box, the system used by the ordinary scraper plant, thereby saving not only the wear on the scraper but also the extra steam necessary to drag a loaded scraper up an incline over rough ground.

Goldstream.—Fifteen underground placers and four steam-scraper plants were operated on Goldstream, employing 100 men. On First Chance and Gilmore Creeks, both tributaries of Goldstream Creek, placer mines were worked in a small way.

Ester Creek.—Twelve underground placer mines were operated on Ester Creek during the year, employing 150 men.

Happy Creek.—Two plants were operated on Happy Creek with considerable success, new pay having been struck during the winter on the left limit of the creek at a depth of 140 feet. The ground was thawed, but stood well and could be worked economically, there being no water underground.

Other streams.—St. Patrick Creek, Smallwood Creek, and Fish Creek were worked to some extent during the season, but no very extensive mining was done.

LODE MINING.

The most important lode operations in the district were the Rhoades-Hall mine, on Bedrock Creek, and the Crites & Feldman mine, on Moose Creek. The Rhoades-Hall mine closed on the 1st of September, and will remain closed for the winter. This is the first time that this mine has closed since its inception. The Rhoades-Hall mine employed an average of 25 men. The Crites & Feldman property employed five men in the mine and one in the mill, and mined and milled on an average seven tons of ore a day from a ledge with an average width of 8 inches, working one 8-hour shift. A new five-stamp mill was installed on Fairbanks Creek for the Mayflower and Ohio quartz mines. There was also a small Huntington mill installed early in the year on Fairbanks Creek near the same property doing custom milling. Both helped to encourage development work in this vicinity. The Mizpah was operated during the winter, and some very good ore was milled at the Heilig mill on Fairbanks Creek, and later a headframe and steam hoist were installed at the mine and development work continued. On the Whitehorse and Yellowjacket some development work was done during the winter months and about 30 tons of ore was shipped to the mill.

At the head of Too Much Gold Creek, McNeil & Huddelson took out considerable ore and did extensive development work on a very promising ledge of gold-bearing ore.

The American Eagle claim, Fairhaven & Foss, drove an adit 450 feet to undercut the lode during the winter and extracted considerable ore in the summer.

On the McCarthy property on the divide between Fairbanks Creek and Chatham Creek 30 tons of gold-bearing ore was mined during the winter and early spring of 1915 and shipped to the mill.

The Homestake mine, at the head of Wolf Creek, was worked under a lease. The ore produced was from a rich vein that averaged only 5 inches in width. About 50 tons was mined and milled, which is said to have yielded over \$100 per ton.

The Chatham mine was operated for antimony, there being a lode of that ore having an average width of 4 feet. One hundred tons was shipped from this mine to San Francisco during the summer. The ore was hauled to the

railroad by team, and from there to Fairbanks by the Tanana Valley Railway. From there it was shipped on barges to St. Michael and loaded on steamship for San Francisco.

The Wild Rose and Soo mines were worked during the winter months and the mill ran whenever ore was available. Twenty-four tons of ore was milled.

On the Wyoming and Colorado mines, development work was done during the winter, and 39 tons of ore shipped to the Chatham mill and milled.

In the Ester district the most important work done was that of Tyndall, Finn & McLaughlin on the Bondholder and Yellow Jacket claims, near the head of St. Patricks Creek. In June, 1914, an adit was started 280 feet lower than the collar of the main Bondholder shaft, and work was continued on it until June 1, 1915, when it was driven over 600 feet; work was suspended for the summer on account of poor air. From surveys made the adit should undercut the Bondholder lode at a distance from the portal of 700 feet. The tunnel is $6\frac{1}{2}$ feet high, has 6-foot sills and 4-foot caps, with an 18-inch gage track of 8-pound rails. Steel cars of 10 cubic feet capacity are in use. Tyndall & Finn also did some development work on the Mohawk lode claim. A 6-foot vein was discovered carrying very good values. Three shafts were sunk to a depth of 25 or 30 feet along the strike of the vein.

Antimony was also mined on Treasure Creek. The mining here was done by open-cutting the formation, and digging out the ore which occurred in shoots, kidneys, and irregular masses along the fissuring. The ore was broken and hand sorted, and no ore carrying less than 50 per cent antimony was shipped. A tramway was built from the mine to the Tanana Valley Railway and the ore trammed to the railway, where it was loaded for shipment to Fairbanks to be loaded on barges for shipment via St. Michael to San Francisco. This mine produced 600 tons of antimony ore. Considerable prospecting was done on a number of other stibnite lodes in the Fairbanks district. If the present high price of antimony continues, antimony ores will become quite a factor in the mineral output of this Territory.

TOLOVANA DISTRICT.

The newly discovered Tolovana district is located about 70 miles from Fairbanks, in a northerly direction, and is connected with Olnes, a station on the Tanana Valley Railroad, by a road 60 miles long. Another route of access is by launch up the Tolovana River to a log jam, around which a tram has been built. The distance to the log jam, by the windings of the river, from the Tanana is about 200 miles. Above the log jam a launch can be used for another 20 miles to the head of navigation; thence a wagon can go up the river bars to Brooks, the principal settlement of the district, where there is a post office and a wireless telegraph station. The Tolovana district was visited early in April by way of the Olnes route; several properties on Livengood, Olive, and Ester Creeks and Tolovana River were also visited. The richest deposits found up to that time were on the first and third tier benches off No. 5 above on Livengood Creek and off Discovery on Olive Creek. It has since developed that most of the gold mined during the season was taken from the bench off No. 5 above on Livengood, third tier. The depth to bedrock on this claim was 97 feet, while on No. 28 above, third tier benches, it was 32 feet, and on the third tier benches off Discovery the depth was 102 feet. The depth to bedrock on the first tier benches off No. 5 above Discovery was 28 to 30 feet. There were several holes sunk on those claims. On the present creek bed of Livengood several claims were visited where work was being done, but

up to the time of visit no pay had been found. The auriferous gravels are widely distributed in the district, and the work already done has proved the presence of workable placers. The value of the gold output for the year, 1915, was approximately \$40,000.

CIRCLE DISTRICT.

The principal operation in the Circle district was the installation and operation of a dredge on Mastodon Creek. A number of hydraulic plants were also operated, as well as a large number of smaller placers.

TENDERFOOT DISTRICT.

The Tenderfoot district was visited early in May. The principal productive creeks of this district in 1915 were Tenderfoot, Democrat, Banner, and Buckeye. Nos. 4 and 5, Tenderfoot Creek, were the principal producing claims. The ground is 70 feet deep and drifting methods were used. The ground is frozen. There were about 75 men employed in this district.

MANLEY HOT SPRINGS DISTRICT.

The Hot Springs district was visited in January. Very little work was under way at the time. Development work was being done on Woodchopper Creek, where good prospects were found and the ground was being blocked out for summer operations. The other principal creeks where work was being done were Deep Miller, Sullivan, and Cache. Reports after the close of the season would indicate an output of gold to the value of approximately \$600,000. There was a small production of stream tin in connection with the gold mining.

RUBY DISTRICT.

The Ruby district was visited in June and 16 properties were inspected. The principal creeks are Poorman and Flat, in the Poorman district, and Long Creek, in the Long Creek district. Placer mining was done also on Birch, Trail, Tamarack, Spruce, Tenderfoot, and Duncan Creeks. New pay was found on Spruce Creek early in the spring and several operators were preparing to hoist pay on that creek. Extensive prospecting was done on Greenstone Creek with a drill, and a dredge will be installed in the spring of 1916. The value of the gold output for the year 1915 was approximately \$800,000 or about the same as 1914.

KOYUKUK DISTRICT.

The Koyukuk district was not visited during 1915 by the [Territorial] inspector. The estimated production of gold from that district for the year is \$300,000. The most of this was taken from Hammond River and Nolan Creek. A new discovery of placer gold was made on Jay Creek, a tributary of Wild River, and here considerable gold was mined.

INNOKO DISTRICT.

The Innoko district is estimated to have produced gold to the value of \$190,000 in 1915. The principal producing creeks were Ophir, Yankee, Little, Spruce, and Gaines. Two scraper plants were operated on Gaines and two on Yankee Creeks, during the mining season.

IDITAROD DISTRICT.

The Iditarod district was visited during the month of June. Eleven placer mines and two dredges were inspected. All of the placer mines were operated by the open-cut method. Four steam-scraper plants were operated; two on Otter, one on Glen, and one on Flat Creeks. Open-cut hydraulic mining was done at the heads of Flat Creek, Chicken Creek, and Happy Creek. One of the dredges was operated on Flat Creek and one on Otter Creek. The principal creeks are Flat, Otter, Glen, Willow, and Black, where about 500 men were employed. A drag-line scraper was installed on Willow Creek during the summer, the first to be used in placer mining in Alaska. It is reported to be very successful. The gold output for this district was \$2,050,000 or practically the same as 1914. The high cost of fuel is one of the greatest drawbacks of this district. Wood costs from \$10 to \$18 per cord delivered at the boilers. Distillate, which is used on one of the dredges, costs 52 cents per gallon, delivered at the dredge. At the power plant of the Yukon Gold Co., on Flat Creek, the supply of wood in the vicinity of the power plant became so small that a new location on the Iditarod River was selected and a power plant constructed. New boiler equipment was installed, consisting of three 200-horsepower units. The electric equipment used at the Flat Creek power plant was moved during the winter and installed. It was ready for operation at the opening of the mining season. The new plant will have the benefit of cheaper fuel and improved water conditions, which will not only lower the power cost but will make it possible to operate later in the season, if the weather conditions permit.

MARSHALL DISTRICT.

The Marshall district was visited in the latter part of June. One placer claim on Wilson Creek and one on Disappointment Creek were being operated by the open-cut, ground-slucing, and pick-and-shovel methods. Gold was discovered on those creeks in 1913. In 1915 gold was discovered on Willow Creek, in this district, and active prospecting and development work was being done on four claims on that creek at the time of visit. These were being worked by the open-cut methods. One bench claim was being worked by the underground drifting method. The ground being frozen on the bench, the ground in the creek bottoms was thawed. Some development work was done on a quartz vein near the head of Willow Creek. A return of \$80 per ton was received from the mill test of the ore. There were 150 men in the district. The gold output for the year is estimated at \$10,000.

CHISANA DISTRICT.

The value of the gold output of the Chisana district for the year 1915 is estimated at \$135,000, or about half that of last year. The principal operations were on Bonanza Creek. New discoveries of placer gold are reported to have been made on Dry Gulch, a tributary of Johnson Creek.

SEWARD PENINSULA.

The Seward Peninsula mines produced gold to the value of \$2,900,000 in 1915, against \$2,705,000 in 1914, an increase of \$195,000. In addition to the gold production there was shipped 157 tons of tin ore, valued at \$79,471, and 132 tons of antimony ore, valued at \$30,360. There were 33 dredges operated on Seward Peninsula in 1915, against 39 in 1914. The reason assigned for the decrease is that a number of dredges have worked all of the gravel that could

be worked at a profit in the immediate vicinity and, no new ground having been acquired, are necessarily idle. There were four dredges installed on Seward Peninsula during the year, one on the Kougarok River, one on Camp Creek, one on Center Creek, and one on Buck Creek. The first three were gold dredges; the other was used for tin only, in the York district.

There was a new discovery of placer gold on Dime Creek in the Council district, a tributary of the Koyuk River, but there was no output of gold this season. Late in the fall a gold quartz strike, which promises to be of some importance, was made on Boulder Creek, a tributary of Snake River, at a distance of about 12 miles from Nome. Some of the ore showed an abundance of free gold, visible to the naked eye. There was 157 tons of cassiterite, or tin ore, shipped from the York district. In this district development work was continued on the cassiterite lode-tin mine on Lost River, 80 feet being driven on the lower adit. Some development work was done on the Bartels lode-tin mine on Cape Mountain, also a new lode. On Potato Mountain, near the head of Sutter Creek, a tributary of Buck Creek, some placer tin was recovered by the sluice-box method during the summer season.

Late in the season work was started and mining continued on the Sliscovich antimony mine on Manila Creek, a tributary of Nome River, and a small shipment of stibnite made. This ore carries considerable gold. Some stibnite was mined at the Hed & Strom properties, a few miles north of the Sliscovich property, and shipped.

A placer-gold strike was made on the coastal plain near Solomon River, supposedly the continuation of the third beach pay streak at Nome. It is located about 6 miles back from the present beach and lies at a depth of 40 to 50 feet below the surface. The bedrock elevation above the present beach is from 62 to 70 feet. The bedrock elevation of the third beach at Nome is 68 feet above the present beach level. The ground had been drilled during the summer season, and some very good values found. Fuel and supplies were landed at Solomon before the close of navigation, and developments during the winter should prove the value of the placer-gold deposits.

NOME DISTRICT.

The Nome district was visited during July and August. Fourteen underground placer mines, four hydraulic mines, and nine dredges were inspected. The principal creeks are Little, Anvil, Dry, Bangor, Boulder, Center, Dexter, Hastings, and Hobson. Most of the underground placer mines were situated on the tundra, adjacent to Nome, within a radius of 3 miles. In addition to the creeks named, there were several operations on smaller creeks. The present beach claimed considerable attention, about 100 men being employed with surf washers, gasoline plants, and sluicing with water gathered from the adjacent tundra.

SOLOMON DISTRICT.

In the Solomon district five dredges were operated, against nine in 1914. Two hydraulic mines were operated on the tributaries of Solomon River. The beach gold discovery is referred to elsewhere.

CASADEPAGA DISTRICT.

Two dredges were inspected in the Casadepaga district. Three were operated in 1914. The Willow Creek dredge suspended operations. In addition to the two dredges, there was some work done on several small creeks, tributaries of the Casadepaga River.

COUNCIL DISTRICT.

There were six dredges operated in the Council district—two on Ophir Creek and one each on Crooked, Melsing, Camp, and Elkhorn Creeks. The Warm Creek and Mystery Creek dredges were idle during 1915. The Camp Creek dredge was a new dredge, installed during the summer, and started operations the first of September. There were two hydraulic plants operated on Ophir Creek and one on Crooked Creek. In addition to these, there were several smaller operations on the different creeks of the district.

FAIRHAVEN DISTRICT.

There were three dredges operated in the Fairhaven district during the season, against four last year. One of the dredges on the Inmachuck River was idle. The Fairhaven Ditch & Hydraulic Co. operated its property on the Inmachuck, and the Candle Ditch Co. its property on Candle Creek. Hydraulic operations were continued on Bear Creek. There were many smaller operations during the season. About 200 men were employed.

PORT CLARENCE DISTRICT.

Six dredges operated in the Port Clarence district in 1915. The dredge on Windy Creek and the one on Sunset operated for gold only; the two on the Anikovik River operated for tin and gold together. The York Dredging Co.'s dredge continued working for tin alone on lower Buck Creek. The American Gold Dredging Co. installed a new dredge on upper Buck Creek to dredge for tin. This dredge was started the first of September, and consequently operated but a short period during the season. It has a bucket holding 2 cubic feet in an open-connected line, develops 80 horsepower by distillate engines, and has an estimated capacity of 800 cubic yards.

KOUGAROK DISTRICT.

The Kelleher dredge was operated successfully on the upper Kougarok River during the season. The Bering Dredge Co. installed a new dredge on the Kougarok River, near the mouth of Henry Creek, and started operations the first of August. A hydraulic plant was operated on Macklin Creek. Five claims were operated above Taylor Creek by ground sluicing and pick and shovel methods. Two were on Dahl Creek, and two on Coffee Creek. Drilling was done on the lower Kougarok and on Quartz Creek with a view to installing dredges. One hundred men were employed in this district.

SOUTHEASTERN ALASKA.

Mining throughout southeastern Alaska, which includes the Ketchikan, Wrangell, Petersburg, Juneau, Skagway, and Sitka districts, was particularly prosperous.

The opening of two large low-grade mines at Juneau has stimulated the search for other ore bodies of a like nature; and the high price of copper resulted in operations being resumed at a number of copper properties in the Ketchikan district that had been idle for some years. The gold production, including the placer gold of the Porcupine district, amounted approximately to \$5,435,000, according to figures collected by the United States Geological Survey.^a The copper

^a Brooks, A. H., *Mineral Resources of Alaska, 1915*, U. S. Geol. Survey, 1916, p. 74.

production, 4,500 pounds, which all came from the neighborhood of Ketchikan, is valued at about \$300,000. The value of the silver, marble, lead, and gypsum amounted to a little over \$350,000.

KETCHIKAN DISTRICT.

ALASKA INDUSTRIAL CO.

The Jumbo mine of the Alaska Industrial Co., more commonly known as the Sulzer mine, is on Hetta Inlet on the west coast of Prince of Wales Island.

The main entrance to this mine is a crosscut at an elevation of 1,500 feet. The ore bodies so far opened have been near the surface and many of them have been worked as open cuts during the summer months. A winze has been sunk from the crosscut from which several sublevels have been driven with connections through to the surface for oreways and ventilation. The ore, which is mainly chalcopyrite, lies in an altered zone between granite and limestone, or in plain schist, in irregular lenses which have but little continuity and make mining difficult. An air hoist has been installed at the winze. The ore is raised in buckets and dumped into cars which are trammed by hand to the entrance of the crosscut, where the ore is sorted before going into the bunkers. The bunkers constitute the upper terminal of an 8,000-foot aerial tram, the lower terminal being at the bunkers on the wharf of the company at tidewater. Power is furnished by a hydroelectric plant on the beach.

DUNTON MINE.

At the Dunton mine, near Hollis, on the eastern coast of Prince of Wales Island, an inclined shaft has been sunk over 200 feet on the ore and several levels and sublevels opened from this shaft. The vein strikes almost north and dips about 30° west. The footwall is slate and the hanging wall is in some places slate and in others a porphyritic rock. The ore, which occurs in quartz stringers and veins, is trammed in wheelbarrows to the shaft, hoisted in a self-dumping skip, and crushed in a 5-stamp battery. The pulp flows over amalgamating plates and concentrating tables, the concentrate being shipped to the smelter.

GOODRO MINING CO.

Work was resumed the past season at the Goodro mine, under the direction of S. J. Goodro. The property is at the head of the "Salt Chuck," on the north side of Karta Bay. The principal mineral in the ore is bornite, which occurs in small masses and disseminated particles associated with epidote, feldspar, and biotite, and is inclosed in gabbro. Native gold and considerable chalcopyrite also occur with the ore, and near the surface small amounts of chalcocite and native copper have been found.

GRANBY CONSOLIDATED MINING, SMELTING & POWER CO.

The Granby company has continued developments on the Mamie mine at Hadley, on the east coast of Prince of Wales Island, which it took over in 1913, the It mine, and several groups of claims in the same locality. Ore bunkers have been erected on tidewater and trams built to the mine. The ore is shipped to the company's smelter at Anyox, British Columbia, on the Portland Canal.

The ore bodies at the Mamie mine are contact metamorphic deposits of copper ore included in a zone lying between intrusive diorite and limestone. The chief copper mineral is chalcopyrite; the gangue consists of magnetite, garnet, epidote, pyroxene, and hornblende.

MOUNT ANDREW IRON & COPPER CO.

Work has been resumed at the Mount Andrew mine of the Mount Andrew Iron & Copper Co., 3,600 feet from tidewater on the north shore of Kasaan Bay on the east side of Prince of Wales Island. The ore consists of chalcopyrite associated with magnetite and occurs in irregular deposits in altered limestone. The deposit has been opened by a crosscut with raises to the surface. A winze has also been sunk to prospect one of the ore bodies and a crosscut has been started that will tap the mineralized zone several hundred feet lower than the present workings. A steam-power plant is situated on the beach, and the bunkers at the mine are connected with those on the wharf by an aerial tram.

PRINCETON MINING & MILLING CO.

The Valpariso mine, of the Princeton Mining & Milling Co., is situated at Dolomi, on the eastern side of Prince of Wales Island. The ore, a high-grade gold-bearing quartz ore, lies at the contact of a schist and a dolomitic limestone. The ore body has been opened to a depth of several hundred feet by a shaft on the vein, and drifts have been run on the ore, with stopes through to the surface for ventilation. The property is equipped with a ten-stamp mill, air compressor, and machine drills.

READY BULLION MINE.

The Ready Bullion group of claims is situated about a mile and a quarter from Hollis on Twelve-Mile Arm. A horse tram has been built from the beach to the mine and a 5-stamp mill erected. The vein, which is gold-bearing quartz, strikes north 25° west and dips 50° northeast. The richer part of the vein, 6 to 14 inches, is mined by overhand stoping and trammed by hand in cars to the mill, which is driven by water power.

RUSH & BROWN MINE.

The Rush & Brown property is situated on Prince of Wales Island near the head of Kasaan Bay on the northern side. Two main ore

bodies have been developed. One is a sulphide body consisting of chalcopyrite and pyrite in a gangue of altered graywacke, quartz, and calcite; it is a shear-zone deposit in sedimentary rock. The other ore body is chalcopyrite and magnetite, and occurs at or near a contact zone between granitoid rock and a greenstone tuff or conglomerate. The deposits have been opened by a shaft and several levels, from which stopes have been driven through to the surface, affording excellent ventilation. The ore is hand sorted at the mine bunkers and run down a balanced tramway 300 yards to the main bunkers. From here it is hauled over the railroad some 3 miles to the wharf bunkers, where it is stored for shipment to the smelter.

JUNEAU DISTRICT.

THE ALASKA-GASTINEAU MINING CO.

The Alaska-Gastineau Mining Co., which operates the Perseverance mine, in Silver Bow Basin, about 4 miles from Juneau, is the operating company for the Alaska Gold Mines Co.

The mine is in a large fissured zone of slate and metagabbro, cemented together by a network of quartz lenses and veinlets. It was opened in early days by what was known as the Gilbert workings, which are the present fifth level, and later by a 1,400-foot crosscut, approximately 1,000 feet below the Gilbert development. This is known as the Alexander crosscut. When the Alaska Gold Mines Co. assumed control of the property plans were formulated for developing the mine on an extensive scale. The shaft was sunk from the Alexander crosscut to the thirteenth level, stations cut every 200 feet, and the development of the previously opened levels (every 200 feet) between the Alexander crosscut and the Gilbert workings was continued. A 12,000-foot tunnel was driven from Sheep Creek to connect with the bottom of the shaft, and the mine was opened by a system of ore-ways, raises, and stopes that would permit the rapid handling of an enormous tonnage.

The stopes are worked on a full-breast shrinkage system, just enough ore being drawn to give headroom for the machines. Pillars are left at varying intervals, and the ore is blasted out along the footwall of the stope; from there to the hanging wall the ore caves with little additional blasting. From the stopes the ore passes over grizzlies into the chutes, the oversize being "bulldozed" in bulldoze chambers. From the chutes it is drawn into 4-ton cars of the Granby self-dumping type and hauled by storage-battery motors to the main ore ways. The ore is drawn through the ore ways into 10-ton cars and hauled by electric motors to the mill, which is 6,000 feet from the portal of the tunnel.

The mill was designed to treat 6,000 tons of ore per day, but is capable of handling 25 to 50 per cent more than the original plans called for. The cars are dumped four at a time by a revolving tippie, the oversize from the grizzlies passes through gyratory and jaw crushers and unites with the undersize in a 10,000-ton storage bin cut in the solid rock. From this bin it is conveyed by a belt conveyor to the mill and distributed by a second conveyor to the ore bins. From these it passes to large rolls and impact screens, the oversize being returned by automatic self-dumping skips to the first set of mill bins and the undersize passing to a second set of bins to be drawn into smaller rolls and impact screens, also set in a closed circuit. From the last-mentioned bins the dry pulp is drawn to double-deck Garfield tables, where it is concentrated, reground in tube mills, and passed to Wilfley tables, the concentrate going to the re-treating plant. One of the noteworthy features of the mill is the independence of each unit, the bins being so arranged that stopping one unit of the mill does not affect another unit until the bins between are empty.

Power for the mine and mill is supplied from several sources. At the mine a small hydroelectric plant furnishes power from the water of Gold and Survey Creeks. Also, a large reservoir and hydroelectric plant have been constructed on Salmon Creek, about 4 miles from Juneau. The dam, which is of the radial arch type, is 165 feet in height and 720 feet in length along the crest. The water-storage capacity permits the delivery of 6,000 horsepower the year around. Another plant is under construction on Annex Creek, a tributary to Taku Inlet, that will have an initial capacity of 4,000 horsepower and an ultimate capacity of 12,000 horsepower.

ALASKA GOLD BELT MINING CO.

The Alaska Gold Belt Mining Co. is developing the Nelson-Lott group of claims at the head of Sheep Creek Basin, about 5 miles southeast from Juneau. A crosscut is being driven to intersect the ore bodies, and plans have been made for the erection of mine buildings and a reduction plant.

ALASKA-JUNEAU GOLD MINING CO.

The Alaska-Juneau Gold Mining Co., which owns the Alaska Juneau mine in Silver Bow Basin, about 3 miles from Juneau, is under the same management as the Treadwell properties on Douglas Island.

The ore body is a large fissured zone in metagabbro and slate traversed by a network of quartz lenses and veinlets. The ore first mined was treated in a 30-stamp mill near the upper workings until the value of the ore had been fully determined. The grade of ore having been found satisfactory, a 6,538-foot tunnel was driven to cut

the ore body and an incline raise was driven through to the surface. From these workings the mine has been opened to supply a mill that, when completed, will have a capacity of from 6,000 to 8,000 tons per day. From the mouth of the Gold Creek tunnel a tram which passes through several smaller tunnels has been run along the hillside overlooking the town of Juneau to the pilot plant on the shore of Gastineau Channel. With this plant experiments were conducted to determine the advisability of wholesale or selective mining. From some of the stopes all of the ore drawn was run-of-mine, whereas from others the quartz was thrown into cribbed chutes and the waste used for filling. A new mill is now being constructed.

ALASKA-TREADWELL GOLD MINING CO.

The Treadwell group of mines is situated on the northeast side of Douglas Island, about $2\frac{1}{2}$ miles southeast of the city of Juneau, which is located on the mainland on the other side of Gastineau Channel. The group consists of four mines, which, beginning at the northwest end, are as follows: Treadwell, Seven Hundred Foot, Mexican, and, with a 2,000-foot interval, Ready Bullion. Three separate companies work these mines, as follows: Alaska Treadwell Gold Mining Co., the Treadwell mine; Alaska Mexican Gold Mining Co., Mexican mine; Alaska United Gold Mining Co., Seven Hundred Foot and Ready Bullion mines.

As regards operation, these mines may be considered one enterprise, and steps have been taken to consolidate the stocks of the various companies into one corporation.

The ore on Douglas Island occurs in two separate and distinct dikes of albite-diorite, a deep-seated intrusive rock related to the so-called granites which form the backbone of the coast range of mountains. The ore dikes lie between a hanging wall of metagabbro, or greenstone, and a footwall of black slate. The ore contains occasional horses of schist. The larger of the two dikes provides the ore of the Treadwell, Mexican, and Seven Hundred Foot mines, and below the 750-foot level the workings of the three mines are practically continuous. The Ready Bullion dike lies about 2,000 feet southeast of the end of the Treadwell-Mexican dike and its extent is much smaller. However, the character of the ore varies little from place to place.

The mines are about 2,400 feet deep and the method used in mining is the shrinkage system, or back-stoping in ore-filled stopes. Levels are driven from the shafts at vertical intervals of about 110 to 200 feet. At an elevation of 25 feet above the level, stopes are cut the full width of the ore, but vary in length from 60 to 100 feet. Pillars 25 feet thick are left between stopes. Chute raises are driven from the levels into the bottom of the stopes. The broken ore is drawn

through these chutes and trammed to pockets at the shaft. When the stopes have been cut out, back-stoping begins. The top of the broken ore is kept about 7 feet below the back as the stope progresses through to the level above. After the stope is finished the broken ore is drawn and the pillars allowed to cave. It is often possible to recover a large proportion of this caved ore.

The 2-ton cars in which the ore goes to the shaft pockets are hauled by horses, storage-battery locomotives, gasoline locomotives, or stationary tram engines with endless rope. From the ore pockets at the various shafts the ore is drawn into skips and hoisted to the surface. The skips are dumped automatically, the ore falling into gyratory crushers and thence to the various bins from which it goes to the various mills.

The milling plant consists of five mills having a total of 930 stamps with 30 additional stamps under construction. The tonnage treated is approximately 5,000 tons per day. The treatment is stamping, amalgamation, and concentration on Frue vanners. The concentrates, which amount to about 100 tons per day, are treated at the cyanide plant. This plant also retorts the amalgam from the mills and refines all of the bullion. The treatment at this plant is as follows: Regrinding in tube mills in cyanide solution, agitation in Pachuca tanks to dissolve the gold, filtering off the pulp, precipitating the gold from the solution by means of zinc dust, and refining the precipitated gold bullion.

The total production to January 1, 1915, was 24,117,633 tons of ore, which yielded \$58,366,937.88, or \$2.42 per ton of ore milled. The number of men employed is about 1,300 and the average earning capacity per man is \$100 per month.

The power requirements of the operating companies are supplied from four sources. The original and cheapest source is from water-power wheels at the various mills and compressors. The water is collected on Douglas Island by a system of dams, canals, ditches, and pipe lines extending from Fish Creek, 14 miles northwest of Treadwell, to Ready Bullion Creek, 3 miles southeast. Over 4,000 horsepower is obtained from this source during the wet season. Up to 1910 the only other power available was supplied by direct-connected steam engines, which were operated as alternatives for direct water power. Ore hoisting is done by steam power only.

In 1910 electrification of the power system began, and as a result the Sheep Creek hydroelectric plant, a flood-water plant having a capacity of 2,500 kilowatts, and the Nugget Creek plant, having a capacity of 3,000 kilowatts, were constructed. These plants are situated on the mainland, the Sheep Creek plant being 4 miles southeast of Juneau, and the Nugget Creek plant at the foot of Mendenhall Glacier, 12 miles northwest of Juneau.

Electrical power is also generated by steam at the central power plant at Treadwell. This plant contains four generators, each directly connected to a steam turbine running at a speed of 3,600 revolutions per minute, and is used when the power supply from the hydroelectric plants fails. The capacity of the plant when the power is taken at Treadwell is equal to that of both the hydroelectric plants. The present policy is to eliminate direct steam power where possible.

Crude oil is used under all boilers for generating steam for power or heat. It is brought from California in tank ships and is stored at Treadwell in eight tanks having a storage capacity of 180,000 barrels. The annual consumption is a little over 200,000 barrels.

ALASKA TREASURE GOLD MINING CO.

Work has been continued intermittently at the Alaska Treasure mine on Douglas Island, about 3 miles southeast from Treadwell. A crosscut has been driven to cut the mineralized zone and a small steam plant and a 5-stamp mill are situated near the beach.

ALGUNICAN DEVELOPMENT CO.

The Algonican Development Co. is operating the Jualin mine on Johnson Creek, about 7 miles from Berners Bay. A crosscut has opened three veins in diorite which strike about north 40° west, dip 60° to 90° northeast, and have an average width, as stoped, of about 5 feet. A compressor plant driven by water power has been installed, with additional mining machinery, and a deep crosscut is being driven to tap the ore body. The crosscut is necessary because the diorite is "blocky" and the joints carry a considerable volume of water which makes the expense of pumping prohibitive. The property is equipped with a 10-stamp mill.

EAGLE RIVER MINING CO.

The Eagle River Mining Co. owns the Eagle River group of claims at Amalga, about 7 miles from tidewater on the Lynn Canal, where 10 adit levels with connections for ore handling and ventilation have been driven. The mine is equipped with a 20-stamp mill.

EBNER GOLD MINING CO.

The Ebner Gold Mining Co. continued exploration work at the Ebner mine, which joins the Alaska-Juneau, in Silver Bow Basin. The deep crosscut, begun a few years ago, was completed. Its total length is 3,400 feet. This crosscut intersected the ore body under the old workings, and over 8,000 feet of development work has been done on the crosscut level.

A testing plant, consisting of five stamps, amalgamating plates, Wilfley table, and regrinding apparatus, was installed, as well as a 12-drill two-stage Ingersoll-Rand compressor. Power is furnished by a Pelton wheel under a 480-foot head.

KENSINGTON MINING CO.

A few years ago the Kensington Mining Co. consolidated a number of claims in the neighborhood of Berners Bay, about 60 miles north of Juneau. One of the old mills was rehabilitated for use as a pilot plant and development advanced steadily. Sufficient progress has been made to warrant the erection of a mill and a 500-ton plant will probably be constructed during the coming season.

SITKA DISTRICT.

CHICHAGOF MINING CO.

The Chichagof mine is working a vein of high-grade gold quartz in a shear zone in a graywacke. The company's claims, which are on Klag Bay on the west coast of Chichagof Island, about 50 miles north of Sitka, embrace the original Chichagof mine and the adjoining Golden Gate ground. The claims have been opened by a 4,000-foot drift from which two shafts, one 840 feet and one 2,500 feet from the tunnel mouth, have been sunk 800 feet on the ore. A 634-foot raise has been driven from this drift to the Golden Gate workings to provide an ore way and ventilation. Eight levels have been opened from the first incline and six from the second, and at the face of the main drift there is approximately 1,800 feet of backs.

There are two mills on the ground, the Chichagof and the Golden Gate. In the former, which contains 20 stamps, the crushed ore from the batteries passes over plates to a tube mill, from which it goes to a second set of plates, thence to Diester tables, and finally is treated by flotation. In the Golden Gate mill there are 10 stamps and the battery pulp, after flowing over amalgamating plates, is treated on Wilfley tables.

PACIFIC COAST GYPSUM CO.

The Gypsum mine of the Pacific Coast Gypsum Co., which is situated at Gypsum, on Chichagof Island, is connected to ore bunkers at tidewater by a railroad 1 mile long. The mine is opened by a shaft from which levels have been driven and raises made to the surface for ventilation. The stopes, which alternate with pillars, are worked on the full-breast system, only enough of the broken ore being drawn through the chute to give working room between the ore and the roof. The ore is shipped to the company's plant at Tacoma, Wash.

SOUTHWESTERN ALASKA.

The Kenai Peninsula, Alaska Peninsula, Cook Inlet, Matanuska and Susitna Rivers, Prince William Sound, and the Copper River

Basin constitute the principal mining districts throughout southwestern Alaska.

By far the most important output from these districts was the copper ore from the Copper River Basin and Prince William Sound, although a number of small lode-gold properties were in operation and considerable placer gold taken out. A dredge was installed near Hope at the head of Turnagain Arm.

COPPER RIVER DISTRICT.

ALASKA CONSOLIDATED COPPER CO.

Development work was continued under bond on the property of the Alaska Consolidated Copper Co. on Nugget Creek, a tributary of the Kuskulana. It was planned to install a compressor and power plant and equip the property with proper mining machinery during the winter.

GREAT NORTHERN DEVELOPMENT CO.

The assessment work only was done on the Great Northern Development Co. property on Clear Creek, a tributary of the Kuskulana River.

HUBBARD-ELLIOTT COPPER CO.

Development was continued at the property of the Hubbard-Elliott Copper Co., on Elliott Creek, a tributary of the Kotsina.

KENNECOTT COPPER CORPORATION.

The Kennecott Copper Corporation is operating two mines, the Bonanza and the Jumbo, and developing a number of other claims in the Copper River district. The mines are close together and about 3 miles from the concentrator at the terminal of the Copper River & North Western Railroad. Both are connected with the concentrator by Bleichert aerial tramways.

The ore at each of the properties is largely chalcocite, with smaller amounts of covelite and copper carbonates. It occurs in irregular bodies and veinlets in a limestone.

The Jumbo is opened by a shaft inclined 33° , and the Bonanza by a crosscut and inclined shaft of approximately the same angle. Both shafts are down to the seventh level, the stations being 100 feet apart vertically. The ore bodies are irregular, so no one system of mining is followed, but in each part of the mine the system that seems the best fitted for the work is utilized. The hanging wall being extremely hard, the larger bodies are worked off in benches, whereas at the surface workings of the Bonanza the first large ore body was

mined through a "glory hole." The ventilation throughout most of the mine is natural, although in advanced workings the air is forced through a 9-inch pipe with 6-inch splits.

The Jumbo tramway, which was completed this year, is 16,600 feet long, has 19 towers, 3 break-overs, and 3 tension stations. The track cable on the loaded side is $1\frac{1}{4}$ inches in diameter, the one on the empty side is 1 inch, and the haulage cable is $\frac{7}{8}$ inch in diameter. The buckets have a capacity of 6 cubic feet, and the tram has a capacity of 25 tons per hour when running at a speed of 500 feet per minute.

The company provides excellent living quarters for the men, with pool, billiard, and reading rooms, at each of the properties and at the concentrator.

A new leaching plant to treat the carbonate ore has been installed this season, though all of the details of the process have not been finally determined. A flow sheet of the concentrator is shown in Plate I.

MOTHER LODE COPPER MINES CO.

The property of the Mother Lode Copper Mines Co. is about $1\frac{1}{2}$ miles from the Kennecott Bonanza mine and 14 miles from McCarthy, a station on the Copper River & North Western Railroad. A wagon road has been graded to the railroad, and considerable ore has been shipped each winter while sledding was good. The property has been opened by a crosscut and an inclined shaft on the ore, which is largely chalcocite. A 7,000-foot tramway has been built from the mine to the bunkers on McCarthy Creek, and plans have been completed for the installation of more machinery and a concentrator.

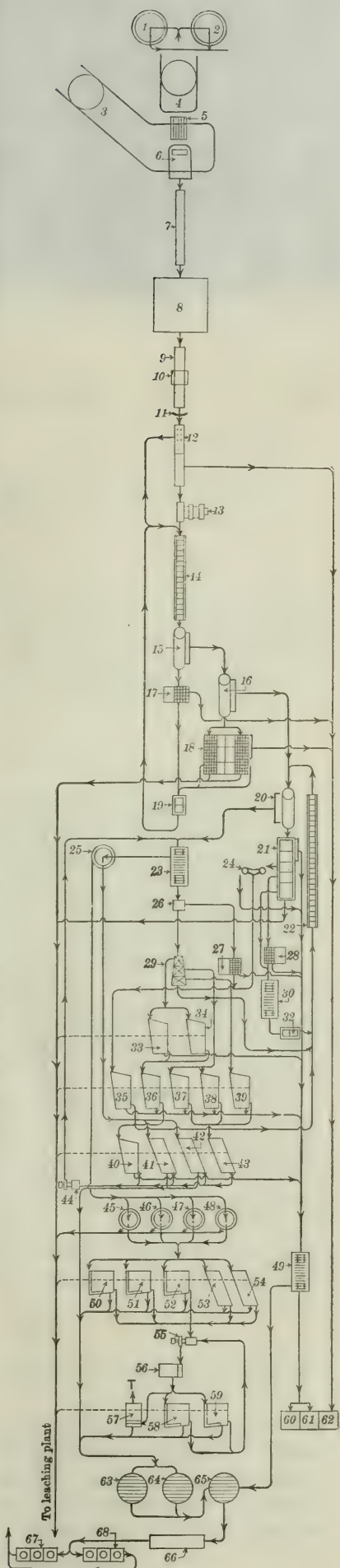
PRINCE WILLIAM SOUND.

More interest in mining was manifested in the Prince William Sound district this year than for a number of seasons, owing to the high price of copper. The producing mines worked to full capacity, and shipments were resumed at a number of properties where only assessment work had been done for a few years. The tramway from the Midas mine to the beach was completed, and the new concentrator at Latouche was put in continuous operation.

ALASKA MINES CORPORATION.

The Alaska Mines Corporation has taken over the Schlosser property on Fidalgo Bay, formerly operated by the Fidalgo-Alaska Copper Co. The 2,800-foot aerial tram was repaired and new accommodations for the men provided. Underground development opened several bodies of chalcopyrite.

1, 2, two 20-foot settling tanks; 3, 4, two Bleichert aerial trams; 5, grizzly, bars spaced 2½ inches apart; 6, 13-inch by 24-inch Buchanan crusher; 7, 20-inch belt conveyor; 8, 1,200-ton storage bin; 9, 30-inch belt conveyor, inclination 18°, speed 35 r. p. m.; 10, electric belt weigher; 11, 60-inch Snyder sampler, cuts out 1/20 part for sample; 12, shaking screen, 1¼-inch holes, for sorting free mineral; 13, 36-inch Symons disk crusher; 14, 16-inch bucket elevator, 70 feet, center to center of pulleys, with 14-inch by 7-inch by 5½-inch cups; 15, 48-inch by 108-inch trommel, with round holes 18 mm. in diameter; 16, 48-inch by 108-inch trommel, with round holes 11 mm. in diameter; 17, bull jig; 18, double, three-compartment Harz jig; 19, one set of 36-inch by 16-inch Traylor rolls; 20, 48-inch by 108-inch trommel with round holes 1 mm. in diameter; 21, 25-foot Hancock jig; 22, 14-inch elevator; 23, Esperanza drag classifier; 24, simplex Callow screen; 25, Callow tank; 26, single-spigot classifier; 27, 28, two one-compartment Harz jigs; 29, three-spigot Richards classifier; 30, Esperanza dewaterer; 32, one set of 36-inch by 16-inch Traylor rolls; 33, 34, two No. 6 Wilfley tables; 35, 36, 37, 38, 39, five No. 6 Wilfley tables; 40, Wilfley table; 41, 42, 43, three James sand tables; 44, 2-inch centrifugal pump; 45, 46, 47, 48, four 6-inch Callow tanks; 49, Esperanza dewaterer; 50, 51, 52, three Deister slime tables; 53, 54, two James slime tables; 55, 2-inch centrifugal pump; 56, 5-inch by 8-inch dewatering tank; 57, 6-inch Frue vanner; 58, 59, two Deister slime tables; 60, 61, 62, concentrating bins; 63, 64, 65, three concentrate settling tanks; 66, overflow tank; 67, 68, two 250-gallon per minute triplex pumps for returning mill overflows to upper settling tanks.



FLOW SHEET OF KENNECOTT CONCENTRATING PLANT.

[The text in this section is extremely faint and illegible. It appears to be a list or a series of entries, possibly names and dates, but the characters are too light to transcribe accurately.]

BIG FOUR MINE.

Only the assessment work was done on the Big Four property on Brevier, a tributary of Mineral Creek.

CLIFF MINE.

The Cliff mine has been taken over by the owner, H. E. Ellis, and work has been resumed on the Mystic No. 1 claim. The ore was trammed to the mill, which was run intermittently. The mill is equipped with a 6-stamp Nissen plant, six concentrating tables, and three boilers totaling 200 horsepower.

ELLAMAR MINING CO.

The Ellamar Mining Co. works the Ellamar mine at Ellamar, on the eastern shore of Virgin Bay, about 20 miles southwest of Valdez.

The mine is opened on seven levels from a three-compartment, vertical shaft 600 feet deep, crosscuts being driven from the shaft to the ore. A cofferdam has been constructed about the outcrop to prevent the mine from being flooded at high tide. The ore body, which on the 200-foot level is about 250 feet long and over 50 feet wide, fills a fracture zone in sedimentary rocks, chiefly slates. The principal levels have been worked as an open-cut and the lower levels by the shrinkage system. As all of these stopes have been emptied and as considerable ore remained on the walls and in the pillars, a system of filling has been introduced by which the old openings are cribbed and filled and the adjoining ore bodies mined. Crosscuts have been run in the hanging wall and raises driven to obtain waste rock with which the levels are filled as the cribs are built up. The ore is then mined and dropped through cribbed chutes to the level below. After being hand sorted the ore is stored in bins, from which it is loaded by an aerial tramway directly to ships. The ore is mined largely for its copper content, although it contains a high percentage of iron and some gold.

FIDALGO MINING CO.

The Fidalgo Mining Co. owns a group of 24 lode claims on the southeastern shore of Fidalgo Bay.

The ore, chiefly chalcopyrite, lies in a sheared zone through slate, graywacke, and greenstone, that strikes northwest and dips 67° northeast. Two drifts connected by a raise have been driven, the upper one being 130 feet long and the lower one 450 feet long. A 50-ton ore bin has been built at the mine and is connected with a 500-ton bin at the wharf by a 2,000-foot aerial tram.

GALENA BAY MINING CO.

The assessment work was the only development reported at the Galena Bay mine, on the ridge between Galena and Boulder Bays.

GRANBY CONSOLIDATED MINING, SMELTING & POWER CO.

The Granby property is situated near the head of Solomon Gulch, just across the bay from Valdez. Owing to the war in Europe, it was difficult for the company to obtain ships to convey ore from the Midas mine to the company's smelter at Anyox, on the Portland Canal, so that only a small amount of work was done at the mine other than advancing the drifts and completing the tramway.

The ore is principally chalcopyrite, in a quartz and pyritic gangue. The ore body strikes nearly east and west and dips 45° north; it varies from 1 to 20 feet in width, with an average of approximately $4\frac{1}{2}$ feet, and has been opened by three drifts with crosscuts and raises, giving over 200 feet of backs. An aerial tramway, $5\frac{1}{2}$ miles long, with a capacity of 20 tons per hour, connects the mine and wharf. The track cable on the loaded side is $1\frac{1}{8}$ inches in diameter; the one on the empty side is $\frac{7}{8}$ inch in diameter, with a $\frac{1}{2}$ -inch haulage rope. The cable system is driven by a 30-horsepower Foos gas engine. The bunkers on the wharf have a capacity of 3,000 tons and load directly on ocean-going vessels with a belt conveyor, which is driven by a 15-horsepower Fairbanks-Morse gas engine.

GOLD KING MINE.

The Gold King mine, which has been operated under bond by the Gold King Mining Co., was taken over by the original owners and worked in a small way, the mill being run for a short time during the summer. The property is situated near the head of one of the eastern arms of the Columbia Glacier.

GRANITE GOLD MINING CO.

The Granite Gold Mining Co. is working the Granite mine, which is about a mile from the beach at Hobo Bay, on Port Wells. An oil-burning steam plant was installed in 1915 on the beach to generate electric power to replace the gasoline-driven equipment formerly used at the mine and mill. The plant contains two 80-horsepower boilers, a steam engine, and a 160-kilowatt generator.

The vein is $1\frac{1}{2}$ to 8 feet wide, the average width being approximately 26 inches. Its strike is irregular and the dip is roughly 45° north. The fissure cuts a slate-granite contact, so that the walls are variable. The mine is opened with a crosscut and a shaft. A second crosscut has been driven on the mill level, 125 feet below the upper workings, and a raise put up on the vein to connect with the shaft. This pro-

vides ventilation and an ore way to the mill level. To the original 7-foot Lane mill have been added 10 stamps driven by a 60-horsepower motor. The battery pulp from both mills passes over amalgamating plates to tables, the tailing being impounded for future treatment.

CAMERON-JOHNSON GOLD MINING CO.

The Cameron-Johnson property is about 10 miles from Valdez, near the head of one of the arms of the Shoup Glacier. No work was done in 1915 except the assessment work.

KENNECOTT COPPER CORPORATION.

The Beatson Copper Co., working the Beatson-Bonanza mine at Latouche, on Latouche Island, is now part of the Kennecott Copper Corporation, which owns the Kennecott mine on Copper River and the Braden mine in Chile.

The ore body, a large lenticular deposit of chalcopyrite, in a slate and graywacke gangue, has been mined through a "glory hole" and stopes. A main tunnel, with crosscuts, opened the ore body on the level of the bunkers, and approximately 140 feet above this, the open cut, roughly 400 by 100 feet, is worked in benches. The ore is blasted into chutes, "bulldozed," and drawn out on the bunker level. Part of the ore is mined by stopes from the main level, a shrinkage system being employed. Below this level a shaft has been sunk 100 feet and drifts started, but no stopes have been opened on these drifts. A new power plant and concentrator, employing a flotation process, has been completed during the past season. Crude oil is used for fuel in the power plant, which contains three 305-horsepower boilers and two 500-kilowatt turbo generators. A seven-drill, two-stage compressor furnishes air for the machines in the mine.

LANDLOCK BAY COPPER CO.

The Landlock Bay Copper Co. owns a group of seven lode claims on the south side of Landlock Bay. The ores occupy shear zones in slate, graywacke, and "greenstone." On the west side of the ridge, on which the claims are located, two crosscuts have intersected the ore, on which shallow winzes have been sunk. A wharf and 800-ton bunkers have been constructed near the entrance to the lower crosscut, which is about 80 feet above sea level.

MINERAL KING MINING CO.

The Mineral King mine, of the Mineral King Mining Co., is a mile east of Bettles Bay, on Port Wells. Only assessment work was done in 1915.

There are three veins on the property, but except for a few open cuts the exploration work has been confined to one. This vein, which cuts a slate-graywacke series, strikes north 40° west and dips 53° northeast, and varies from 6 inches to 4 feet in width, with an average of 18 inches. A shaft has been sunk 110 feet on the ore, and drifts run on the vein about 200 feet from the 100-foot point. The mine, which is at an elevation of 700 feet, is equipped with a 16-horsepower boiler and a 12-horsepower hoist. A mill site has been staked on the flat near tide where water power is available for power.

MOUNTAIN KING MINE.

The only work done at the Mountain King mine, on Mineral Creek, by the owners during 1915, was the assessment work.

RAMSAY-RUTHERFORD MINING CO.

The Ramsay-Rutherford Mining Co. is working high-grade gold ore located about 11 miles northeast of Valdez. The claims are situated on a ridge east of the main Valdez Glacier, at an elevation of about 3,500 feet. A crosscut was completed this year, tapping the ore on the mill level, and a raise driven to the workings above where several short levels had been opened.

At the mill the ore passes over a 1½-inch grizzly, the oversize going to a 7-inch by 9-inch Blake crusher, driven by a 10-horsepower Foos gasoline engine. From the bins the ore is fed to a five-stamp Hendy mill by a Challenge feeder and is crushed to 40-mesh size. The stamps weigh 1,000 pounds each, have a 6-inch drop, and fall about 110 times per minute. The pulp flows from amalgamating plates to a Deister table, which is driven by a 3-horsepower gasoline engine. Power is furnished for the stamps by a 20-horsepower Foos engine. Another 20-horsepower Foos engine drives a 9 by 11 inch compressor to furnish air for the stopers underground.

SEALEY-DAVIS MINING CO.

The Sealey-Davis Mining Co. owns a group of 13 lode claims, bordering on the eastern shore of Shoup Bay, about 14 miles from Valdez. The vein, which cuts a slate-graywacke series, and has an average width of about 42 inches, strikes north 50° west and dips 61° southwest. It has been opened by a 60-foot open cut, two drifts, and a crosscut, giving a total depth of about 450 feet on the vein.

THOMAS-CULROSS MINING CO.

The Thomas-Culross Mining Co. is developing a group of claims at Thomas Bay, but did little more than the assessment work during 1915.

THREE MAN MINING CO.

The Three Man Mining Co. owns about 40 lode claims tributary to Landlock Bay. The main group, known locally as the Dickey claims, is at the head of the bay, the Alaska Commercial group is a little to the west of these, and the Montezuma group is on the Copper Mountains.

The ore bodies at the Dickey group lie in shear zones in a slate-graywacke-"greenstone" series, have a general west-northwest strike, and dip 45° to 90° north. They have been opened on five levels, with over 2,000 feet of development. The ore is carried on a short jig-back aerial tram from the lower openings to the bunkers on the wharf. The bunkers have a capacity of 800 tons.

KENAI PENINSULA.

The amount of mining on the Kenai Peninsula was about the same during 1915 as in 1914, the operations being mostly on a comparatively small scale. The Kenai-Alaska Gold Co. operated its mill during part of the year and continued development work underground. Some work was done on the Gilpatrick property by outside parties who have a bond on the mine, and the assessment work was done on the Primrose, Scheen-Lechner, Moose Pass, Grant Lake, Blue Bell, and a number of other smaller prospects. A dredge was also installed by Charles Herron on the Six-Mile River near Hope.

WILLOW CREEK (SUSITNA DRAINAGE).

ALASKA FREE GOLD MINING CO.

The group of 16 lode claims, owned by the Alaska Free Gold Mining Co. and leased by William Martin, of Seattle, is situated near the head of Fishhook Creek, on the southern side of the Willow Creek Valley, about 35 miles from Knik.

Several veins have been opened by cuts and short drifts from which the ore is carried to the mill over two aerial tramways. The largest vein is 3 to 10 feet wide, strikes north 20° west and dips about 40° southwest. Both the hanging and the foot walls are blocky quartz-ore diorite which is cut by numerous small quartz stringers containing gold. The mill, 1,800 feet below the mine, is connected to the main mine bunkers by a 2,250-foot span, and these are in turn connected to the mine by a 1,100-foot span. Both tramways are of the jig-back type, using buckets with a capacity of 450 to 500 pounds. The track cables are five-eighths inch in diameter and the pull-back cable is one-fourth inch in diameter.

The mill contains two 10-foot slow-speed Lane mills, run at a speed of eight revolutions per minute, the size of the discharge

product being regulated by the height of discharge and flow of water. Power is furnished by a 10-inch turbine under a 30-foot head and two gasoline engines of 15 and 25 horsepower, respectively. The pulp flows over Wilfley tables to a cyanide plant, which was erected during 1915.

INDEPENDENCE MINING CO.

The Independence Mining Co. is operating the mine formerly controlled by the Alaska Gold Quartz Mining Co. The mine joins the Free Gold mine on Fishhook Creek.

There are two veins known as the Granite Mountain and the Independence in a quartz-diorite. The Granite Mountain strikes north 20° west and dips 16 to 17° southwest, and varies from 2 inches to 4 feet in width, with an average of about 18 inches. The Independence vein strikes parallel to that of the Granite Mountain, but dips more steeply, between 28° and 42° southwest, and averages 30 inches in width. The ore is conveyed to the mill by two jig-back aerial tramways, which have five-eighths inch track and one-fourth inch haulage cables, the buckets holding about 450 pounds of ore.

The mill contains one Nissen 1,000-pound stamp and a battery of three 350-pound stamps. Power is furnished by a Pelton wheel under a 110-foot head.

GOLD BULLION MINE.

The Gold Bullion mine, under bond to Hugh Doheny and L. C. Tomson, of Montreal, Quebec, is on the divide between Willow and Craigie Creeks, about 33 miles from Knik. The vein is a high-grade gold-bearing quartz in a blocky quartz-diorite. Its width, strike, and dip are irregular, though the larger stopes are so flat that all of the ore has to be shoveled.

The ore is conveyed by car and short aerial trams from several openings to the mine bunkers, from there by a jig-back aerial tram to an intermediate bin, and thence by a second jig-back aerial tram to the mill. The tram from the mine bunkers to the intermediate bin is one 1,200-foot span with $\frac{3}{4}$ -inch track and $\frac{1}{4}$ -inch haulage cables with 400-pound buckets. The lower tram is 3,600 feet long and has seven towers. The track cable is 1 inch in diameter, and the haulage cable is $\frac{1}{4}$ inch, with 700-pound buckets.

At the mill the ore passes over a $1\frac{1}{2}$ -inch grizzly and through a 7-inch by 9-inch jaw crusher to the bins, whence it is fed to a five-stamp and a two-stamp battery. The stamps in both batteries weigh 1,050 pounds each, have a drop of $6\frac{1}{2}$ inches, and fall 100 times per minute. The pulp flows over amalgamating plates, Wilfley tables, and canvas, and then to a sand-leaching plant, where it receives a four-day treatment. The concentrate is shipped to the Tacoma smelter.

**ACCIDENTS AT MINES, QUARRIES, AND DREDGES IN ALASKA
DURING 1915.**

In and about the mines, quarries, and dredges of the Territory, between 7,000 and 8,000 persons are employed, over 50 per cent of whom are at the lode mines. On account of the great distances to be traveled and the time necessary for visiting all of the mines, an accurate count of all employees and accidents is at present impossible. During 1915 there were 22 fatalities (see Table 1, p. 46) in all branches of the mining industry, which would give a death ratio of about 3 per 1,000 employees. It is manifestly unfair to compute the death ratio on this basis, as most of the lode mines are in operation during the entire year, whereas the season for the placer mines and dredges is between four and six months.

It has been impossible with the available resources to obtain accurate data on accidents in the placer mines except fatal accidents, but for the lode mines fairly complete statistics are at hand. In 28 lode mines, employing 3,617 men, both underground and on the surface, there were reported 18 fatal, 97 serious, and 415 slight accidents underground and in shops. On the basis of these figures the rates per 1,000 men employed at lode mines are as follows: Fatalities, 4.98; serious accidents underground and in shops, 26.74; slight accidents underground and in shops, 114.74.

In addition there were 22 serious and 51 slight injuries at mills and metallurgical plants at which 520 men were employed. The accident ratios at the mills were therefore 42.31 per 1,000 men employed for serious and 98.08 for slight injuries.

There were four fatalities in the placer mines. There are approximately 3,500 men in the placer mines and on the dredges, and, assuming that each man in a year averages six months' employment, probably a high figure, the fatality rate would be 2.29 per 1,000 men employed. This ratio compares favorably with 4.98 for the lode mines, especially if the intermittent character of the work is taken into consideration.

Eight men were killed by falls of rock in lode mines. This number was nearly 50 per cent of the total number of fatalities at such mines and indicates the care needed to prevent falls. Constant vigilance by both men and bosses is necessary. Every man going on shift should make sure that his working place is safe, regardless of what the men in the off-coming shift or the foreman has said. With the limited information available, the accidents can not be classified so as to show which were preventable, but it is certain that a large proportion of them might have been avoided through the use of proper caution by the men and the mine officials.

Tables 1 to 3 contain statistics on accidents at mines, quarries, and dredges in Alaska during 1915.

TABLE 1.—Fatalities inside and outside the mines, quarries, and

Date of accident. (1915)	Name of person.	Nationality.	Occupation.		Age.	Married or single.	Dependents.	
			Regular.	When injured.			Widow.	Children under 16 years.
Jan. 8	Stephen Naas.....	Canadian	Miner.....	Miner.....	38	Single..		
29	Peter Erickson.....	Swede....	Prospector		46			
Feb. -	Olto Oman.....							
May 4	Axtel Hellund.....	Finn.....	Miner.....	Miner.....	31			
June 3	Richard Hasselberg..	Swede....	Stope boss	Stope boss	34	Single..		
7	John Bonar.....	Russian..	Laborer..	Laborer..	21	Married	Yes..	
29	Anton Sepich.....	Austrian..	Miner.....	Miner.....	58	..do..	Yes..	
July 10	Richard Opitz.....	Swiss....	Machine helper.	Machine helper.	36	Single..		
10	Ralph Maritini.....	Italian...	Miner.....	Miner.....	24	..do..		
Sept. 15	R. Milke.....	Canadian	..do.....	..do.....	About 30.	Married	Yes..	
Oct. 8	John Canale.....	Italian...	..do.....	..do.....	24	Single..		
13	Mato Jono.....	Austrian..	..do.....	..do.....	38			
18	Luigi Battelo.....	Italian....	..do.....	..do.....	38	Married	Yes..	1
Nov. 5	Tony Ujcich.....	Austrian..	Nipper...	Nipper...	36	..do..	Yes..	3
9	Chas. Stevens.....	German...	Machine man in shaft.	Machine man in shaft.	42	..do..	Yes..	
15	Maurice Libbreck....	Belgian...	Chute puncher.	Chute puncher.	23	Single..		
27	Louis Tabacovich....		Chuck sender.	Chuck sender.				
27	Andro Del Castel....	Italian....	Machine man.	Machine man.	24	Single..		
27	George Moore.....	..do.....	Chuck sender.	Chuck sender.	35	..do..		
30	Peter Rogulj.....	Austrian..	Chute puncher.	Chute puncher.	33	..do..		
Dec. 14	John C. Byard.....	American.	Laborer..	Laborer..	38	..do..		
18	Edw. Shanda.....	..do.....	Oiler.....	Oiler.....	28	Married	Yes..	1

dredges in the Territory of Alaska during the calendar year 1915.

Name of company and mine.	Nature and cause of accident.
Glossner & Nass, Linda placer claim....	Attempted to climb out of shaft without signaling engineer. He either fell or was knocked off the ladder by a descending bucket.
.....	Fell down shaft while prospecting.
Ed. Hearn, No. 5, below Tenderfoot Creek.	Fell down shaft on Seventy-Mile Creek. Spine broken by slab falling from the roof.
Alaska United Gold Mining Co., Ready Bullion Mine.	Hasselberg had crossed the stope and was approaching a machine when a slab fell, breaking his leg and injuring him internally. He died the following day.
Beatson Copper Co., Bonanza.....	While Bonar was working in a drift, a small rock dropped. It is supposed that in trying to escape he stumbled and fell, as the rock did not strike him. Physician pronounced death due to heart failure.
Alaska Treadwell Gold Mining Co., Treadwell.	Injured by fall of roof while barring down loose rock in a stope.
Alaska-Gastineau Mining Co., Perseverance.	Opitz had gone for powder. On returning across stope he set the box on a muck pile. While stooping over to take powder out of the box, a rock fell from the roof, fatally injuring him.
Pacific Coast Gypsum Co., Gypsum....	Three men were sinking a shaft. Two went below while the third was to lower some planks. Maritini stood in bottom of shaft instead of in drift and was bit by plank which slipped from rope.
Granby Consolidated Mg., Sm. & P. Co., Mamie.	Milke drilled into a missed hole in a boulder.
U. S. Smelting & Refining Co., Ebner..	Canale and two others, working in open cut, had loaded three holes, lit them, and gone to place of safety. Two reports were heard. Canale said he had not lighted his fuse and returned, when blast exploded and killed him.
Ellamar Mining Co., Ellamar.....	While working in a stope, rock fell and crushed right leg. Taken to Valdez, 30 miles, to physician; lost so much blood en route that he was unable to withstand amputation of leg.
Alaska United G. Mng. Co., 700-Foot... Alaska-Gastineau Mining Co., Perseverance.	Crushed while crossing stope by rock falling from roof. Two men had started a crosscut on the fifth level. They lit the second round of holes and went in both directions along the drift, leaving unguarded the manway from the sixth level. Ujcich came up this manway and walked into blast.
Alaska Mexican Gold Mining Co., Mexican.	Stevens and his partner fired a round in the shaft. They returned to shoot a missed hole, gave blasting signal, but before giving hoisting signal there was an explosion. Presumably powder caught fire, causing premature explosion.
Alaska United Gold Mng. Co., 700-Foot.	Libbreck crawled up the chute to start the ore when the jar from blasting in other parts of the mine started the ore, which crushed him to death.
Kennecott Copper Corporation., Beatson-Bonanza.	Tabacovich, who was working night shift in the "glory hole," went to look for his hat which had blown off. He slipped on the snow and ice and fell 60 feet to the pit below.
Alaska-Gastineau Mining Co., Perseverance.	Was drilling in stope when roof fell, burying him.
.....do.....	Moore was carrying chuck in stope when roof fell, burying him.
.....do.....	Rogulj was walking along the level to get water; train was coming from behind; foreman saw him and called to step aside. He started for the manway, slipped, and fell in front of trip, which crushed him.
Alaska Juneau Gold Mining Co., Alaska Juneau Mill Site.	Deceased was working at grading a mill site. Without warning a slide fell from the cliff, completely burying him.
Alaska Mexican Gold Mining Co.....	Went under hoist to adjust machinery. Engineer asked if he was in safe place; reply affirmative. Hoisted, put on reverse, heard cry, stopped. Injured crushed by counterweight when reverse was thrown.

TABLE 2.—Accidents in Alaska metal mines during the year ended December 31, 1915.

	Killed.	Seriously injured.	Slightly injured.
UNDERGROUND.			
Number killed or injured by—			
1. Fall of rock or ore from roof or wall.....	9	19	71
2. Rock or ore while loading at working face or chute.....		6	34
3. Timber or hand tools.....			53
4. Explosives.....	3	2	4
5. Haulage system (mine cars, mine locomotives, breakage of rope, etc.).....	1	10	30
6. Falling down chute, winze, raise, or stope.....		6	9
7. Run of ore from chute or pocket.....	1	2	6
8. Drilling accidents (by machine or hand drills).....		8	43
9. Electricity.....		1	2
10. Machinery (other than locomotives or drills).....		6	3
11. Mine fires.....		6	1
12. Suffocation from natural gases.....			3
13. Inrush of water.....			1
14. Nails, splinters, etc.....			3
15. Other causes.....			
Total number killed or injured underground.....	14	64	38
SHAFT ACCIDENTS.			
Number killed or injured by—			
16. Falling down shafts.....	2		2
17. Objects falling down shafts.....	1	1	
18. Breaking of cables.....			
19. Overwinding.....			
20. Skip, cage, or bucket.....	1	2	2
21. Other causes.....			1
Total number killed or injured by shaft accidents.....	4	3	5
SURFACE ACCIDENTS.			
(At surface yards and shops.)			
Number killed or injured by—			
22. Mine cars or mine locomotives, gravity or aerial trams.....		8	15
23. Railway cars and locomotives.....		1	
24. Run or fall of ore in or from ore bins.....			4
25. Falls of persons.....		3	22
26. Nails, splinters, etc.....			6
27. Hand tools, axes, bars, etc.....		1	25
28. Electricity.....			4
29. Machinery.....	1	1	9
30. Other causes.....		8	13
Total number killed or injured by surface accidents.....	1	22	98
OPEN-PIT ACCIDENTS.			
Number killed or injured in pit by—			
31. Falls or slides of rock or ore.....	1	5	10
32. Explosives.....	1		
33. Haulage system (cars, locomotives, etc.).....			
34. Steam shovels.....			
35. Falls of persons.....	1	1	1
36. Falls of derricks, booms, etc.....			
37. Run or fall of ore in or from ore bins.....			
38. Machinery (other than locomotives or steam shovels).....			1
39. Electricity.....		1	
40. Hand tools.....		1	
41. Other causes.....			3
Total number killed or injured by open-pit accidents.....	3	8	15
Grand total ^a	22	97	415

^aIncludes 4 fatalities at placer mines, but does not include serious and slight injuries. Complete data on placers not available.

Number of wives left widows, 8.

Number of children under 16 years of age left fatherless, 9.

TABLE 3.—*Accidents in Alaska metallurgical plants during the year ended December 31, 1915.*

	Killed.	Seriously injured.	Slightly injured.
ORE-DRESSING AND MILLING ACCIDENTS.			
Number killed or injured by—			
1. Haulage system (cars, motors, etc.).....		3	9
2. Railway cars or locomotives.....			
3. Crushers.....		2	2
4. Rolls or stamps.....		6	4
5. Tables, jigs, etc.....		2	3
6. Other machinery.....		5	6
7. Falls of persons.....		1	4
8. Suffocation in ore bins.....			
9. Falling objects (rocks, timbers, etc.).....			
10. Cyanide or other poisoning.....			1
11. Scalding (steam or water).....			
12. Electricity.....			3
13. Hand tools, axes, bars, etc.....		2	10
14. Nails, splinters, etc.....			1
15. Flying pieces of rock from sledging or crusher.....		1	
16. Other causes.....			8
Total number killed or injured at mills.....		22	51

DATA ON DREDGES.

Table 4 following shows the number of dredges operating in Alaska during 1915, and various details of the construction and operation of the dredges:

TABLE 4.—Data on dredges in Alaska, 1915.

District, and name of company.	Alaska address.	Creek.	Type.	Size of bucket.	Bucket line.	Maximum digging depth.	Rated horse-power.	Source of power.	Actual capacity, per 24 hours.	Dimensions of hull.
				<i>Cubic feet.</i>		<i>Feet.</i>			<i>Cu. yds.</i>	<i>Feet.</i>
Seward Peninsula:										
Alaska Kougarok Dredge	Taylor	Kougarok River	Two flumes	2	Open	12	80	Distillate	1,200	23 by 54
American Gold Dredging	York	Anicovik	Flume	1½	Close	15	50	do	1,200	23 by 54
Do.	do	Nome beach								
American Tin Dredging	do	Buck	Belt stacker	2½	Open	14	92½	Distillate	1,240	30 by 60
Arctic Dredge	Nome	Hobson								
Arctic Creek Dredge	do	Arctic								
Bangor Creek Dredge	do	Bangor	Belt stacker	3½	Open	35	140	Crude oil	2,000	36 by 92
Bering Dredging	Taylor	Kougarok River	Belt stacker	3	Close	17	90	Steam	1,600	32 by 96
Blue Goose Mining	Council	Ophir	Belt stacker	3	Close	17	90	Steam	1,600	32 by 96
Camp Creek Dredge	do	Camp								
Candle Gold Dredging	Candle	Candle	Flume	1½	Open	14	50	Distillate	1,000	24 by 40
Center Creek Dredging	Nome	Center	Flume	2	Open	12	57	Distillate	850	23 by 46
Deering Dredging & Mining	Deering	Inmachuk	do	1½	do	12	40	do	700	23 by 46
Ernst-Alaska Dredging	Nome	Nome beach	Bucket stacker	2½	do	12	80	Distillate	1,000	34 by 68
Flofin Gold Mining & Dredging	Solomon	Solomon	Flume	2½	do	12	60	Distillate	1,000	28 by 60
Do.	do	do	do	2½	do	18	50	do	1,000	26 by 50
Flume Dredge, No. 1	Council	Crooked	do	2½	do	12	60	do	1,000	28 by 60
Flume Dredge, No. 2	do	Melsing	do	2½	do	12	60	do	1,000	28 by 60
Fries Dredging	do	Inmachuk	do	2½	do	12	60	do	1,000	28 by 60
Goose Creek Dredge	Deering	Goose	Belt stacker	2½	Open	12	97	Distillate	1,400	30 by 60
Hanson & Knowels	Dickson	Hastings								
Inmachuk Dredging	Hastings	Inmachuk	Flume	3	Open	18	107	Distillate	1,400	30 by 62
Johnson Dredge	do	Kugruk	do	3	Close	16	107	do	2,000	30 by 62
Julian Gold Mining	Nome	Osborne	Belt stacker	2½	Open	15	87	do	1,000	30 by 60
Keliber Dredge	Taylor	Kougarok River	Bucket stacker	2½	do	15	90	do	1,000	34 by 60
Kimball Dredge, No. 1	Solomon	Solomon	Flume	2½	do	13	60	do	1,000	30 by 60
Kimball Dredge, No. 2	do	Adams	do	2½	do	13	60	do	1,000	30 by 60
Kugruk Dredging	Candle	Kugruk	do	2½	do	13	60	do	1,000	28 by 60
Nome Consolidated Dredging	Nome	Burbon	Belt stacker	7	Close	35	310	Electricity	2,000	48 by 114
Do.	do	Wunder	do	7	Open	70	330	do	6,000	48 by 114
Do.	do	do	do	7	do	70	330	do	6,000	48 by 114
Nome-Montana-New Mexico Mining & Dredging	Dickson	Goose	Flume	2½	do	10½	65	Distillate	1,100	35 by 60
Do.	do	do								
Oro Dredging	Solomon	Solomon	Bucket stacker	5	do	16	120	Steam	1,600	38 by 87
Otter Creek Dredging	Council	Elkhorn	Flume	1½	do	8	18	Distillate	1,000	16 by 24
Pitruok Dredge	Iditarod	Otter								
Teller	Teller	Sunset	Flume	2	Open	12	80	Distillate	1,000	34 by 68
Plain Mining & Dredging	Nome	do	Bucket stacker	2½	do	12	80	Steam	1,000	34 by 68

Ruby Dredging.....	do.....	Casadapaga.....	Flume.....	23	do.....	9	90	Distillate.....	1,200	30 by 60
Seiverson & Johanson.....	do.....	Solomon.....	Bucket stacker.....	24	do.....	12	80	Steam.....	1,000	34 by 68
Seward Dredge.....	do.....	do.....	Belt stacker.....	5	Close.....	12	25	Electricity.....	4,000	40 by 80
Sevathus Dredge ^a	Nome.....	Arctic.....	Flume.....	23	Close.....	12	60	Distillate.....	1,000	28 by 60
Shovel Creek Gold Dredge ^a	Solomon.....	Shovel.....	Belt stacker.....	23	do.....	15	120	do.....	2,200	do
Solomon Dredging ^a	do.....	Solomon.....	do.....	31	Open.....	25	130	Steam.....	2,000	48 by 85
Star Dredging ^a	Council.....	Mystery.....	Flume.....	23	Open.....	12	150	Distillate.....	1,000	28 by 60
Warm Creek Dredging ^a	do.....	Warm.....	Belt stacker.....	31	Close.....	12	75	do.....	2,200	23 1/2 by 50
Wild Goose Mining & Trading.....	Nome.....	Ophir.....	do.....	31	Open.....	25	160	do.....	2,200	30 by 75
Willow Creek Dredging ^a	Council.....	Willow.....	do.....	3	Open.....	12	90	do.....	1,000	40 by 60
Windy Creek Dredge.....	Teller.....	Windy.....	Two flumes.....	23	Open.....	14	87	Distillate.....	1,000	28 by 60
York Tin Dredging.....	York.....	Buck.....								
Circle:	Circle.....	Mastodon.....								
Berry Gold Dredging.....	Circle.....	Mastodon.....								
Iditarod:	Flat.....	Flat.....								
Yukon Gold Dredging.....	Flat.....	Flat.....								
Kona, Peninsula:	Hope.....	Six Mile River.....								
Herron Dredging.....	Hope.....	Six Mile River.....								
Fairbanks:	Fairbanks.....	Fairbanks.....								
Fairbanks Mining.....	Fairbanks.....	Fairbanks.....								

^a Not in operation in 1915.

TABLE 5.—Data on lode mines in Alaska, 1915.

SOUTHEASTERN ALASKA.

Name of company.	Name of mine.	Mine address.	Superintendent.
Alaska Free Gold Mining Co.		Knik.....	Wm. Martin.
Alaska-Gastineau Mining Co.	Perseverance.....	Juneau.....	B. L. Thane.
Alaska Gold Belt Mining Co.		do.....	A. B. Dodd.
Alaska Industrial Co.	Jumbo.....	Sulzer.....	C. A. Sulzer.
Alaska Juneau Gold Mining Co.	Alaska Juneau.....	Juneau.....	P. R. Bradley.
Alaska Mexican Gold Mining Co.	Mexican.....	Treadwell.....	Do.
Alaska Treadwell Gold Mining Co.	Treadwell.....	do.....	Do.
Alaska Treasure Gold Mining Co.	Treasure.....	Juneau.....	M. Hudson.
Alaska United Gold Mining Co.	700 Foot.....	Treadwell.....	P. R. Bradley.
	Ready Bullion.....		
Algumican Development Co.	Jualin.....	Jualin.....	H. G. Young.
Chichagof Mining Co.	Chichagof.....	Chichagof.....	J. R. Freeburn.
Dunton mine.....	Dunton.....	Hollis.....	
Eagle River Mining Co.	Eagle River.....	Juneau.....	B. L. Thane.
Ebner Gold Mining Co.	Ebner.....	do.....	Geo. Oswell.
Goodro Mining Co.	Goodro.....	Kasaan.....	S. J. Goodro.
Granby Con. M., S. & P. Co.	It and Mamie.....	Hadley.....	Wm. Sweetser.
Kensington Mining Co.	Kensington.....	Juneau.....	B. L. Thane.
Mount Andrew Iron & Copper Co.	Mount Andrew.....	Ketchikan.....	W. J. Rogers.
Pacific Coast Gypsum Co.	Gypsum.....	Gypsum.....	D. C. Stapleton.
Princeton Mining & Milling Co.	Valpariso.....	Dolomi.....	B. A. Eardley.
Ready Bullion mine.....	Ready Bullion.....	Hollis.....	
Rush & Brown.....	Rush & Brown.....	Kasaan.....	U. S. Rush.

COPPER RIVER.

Alaska Consolidated Copper Co.	Nugget Creek.....	Strelna.....	Alfred B. Iles.
Great Northern Development Co.	Gray's Copper.....	Mt. Phillips.....	E. F. Gray.
Hubbard-Elliott Copper Co.	Hubbard-Elliott.....	Elliott Creek via Strelna.	A. J. Elliott.
Kennecott Copper Corporation.	Bonanza-Jumbo.....	Kennecott.....	W. A. Seagrave.
Mother Lode Copper Mines Co.	Mother Lode.....	McCarthy.....	W. B. Hancock.

PRINCE WILLIAM SOUND.

Alaska Mines Corporation.	Schlosser.....	Valdez.....	E. E. Reitter.
Big Four mine.....	Big Four.....	do.....	A. Wilcox.
Cameron-Johnson Gold Mining Co.	Cameron-Johnson.....	do.....	
Cliff mine.....	Cliff.....	do.....	H. E. Ellis.
Ellamar Mining Co.	Ellamar.....	Ellamar.....	L. L. Middelkamp.
Fildalgo Mining Co.	Fildalgo.....	do.....	Wm. Mackintosh.
Galena Bay Mining Co.	Galena Bay.....	Valdez.....	Chas. Simonstead.
Gold King mine.....	Gold King.....	do.....	
Granby Con. M., S. & P. Co., Ltd.	Midas.....	do.....	Geo. E. H. Smith.
Granite Gold Mining Co.	Granite.....	do.....	W. R. Millard.
Irish Cove Copper Co.	Irish Cove.....	Ellamar.....	W. A. Dickey.
Kennecott Copper Corporation.	Beatson-Bonanza.....	Latouche.....	F. R. Van Campen.
Landlock Bay Copper Co.	Landlock Bay.....	Ellamar.....	W. A. Rystrom.
Mineral King Mining Co.	Mineral King.....	Golden.....	
Mountain King mine.....	Mountain King.....	Valdez.....	W. L. Smith.
Ramsay-Rutherford Mining Co.	Ramsay-Rutherford.....	do.....	H. Deyo.
Sealey-Davis Mining Co.	Sealey-Davis.....	do.....	E. C. Sealey-J. M. Davis.
Thomas-Culross Mining Co.	Bugaboo.....	do.....	
Three Man Mining Co.	Three Man.....	Ellamar.....	W. A. Dickey.

KENAI PENINSULA.

Gilpatrick mine.....	Gilpatrick.....	Seward.....	John Gilpatrick.
Kenai-Alaska Gold Co.		do.....	J. R. Hayden.
Porcupine Gold Mining Co.	Porcupine.....	Porcupine.....	J. R. Fringle.
Primrose Mining Co.	Primrose.....	Seward.....	

WILLOW CREEK (SUSITNA DRAINAGE).

Alaska Free Gold Mining Co.	Alaska Free Gold.....	Knik.....	Wm. Martin.
Gold Bullion mine.....	Gold Bullion.....	do.....	Ronald Harris.
Independence Mining Co.	Independence.....	do.....	L. S. Robe.

TABLE 5.—Data on lode mines in Alaska, 1915.

FAIRBANKS.

Name of company.	Name of mine.	Mine address.	Superintendent.
American Eagle mine.....	American Eagle.....	Fairbanks.....	Chris. Foss.
Bond Holder mine.....	Bond Holder.....	do.....	E. Tyndall.
Chatham Mining Co.....	do.....	do.....	Si. Scrafford.
Crites-Feldman mine.....	Crites-Feldman.....	do.....	Henry Feldman.
Homestake Mining Co.....	do.....	do.....	G. St. George.
Mayflower mine.....	Mayflower.....	do.....	H. Kleinsmith.
Mizpah mine.....	Mizpah.....	do.....	A. Hess.
McCarthy mine.....	McCarthy.....	do.....	John McCarthy.
McNeil-Huddelson.....	McNeil-Huddelson.....	do.....	Mike McNeil.
Newsboy Mining Co.....	Newsboy.....	do.....	Louis Golden.
Reliance Mining Co.....	Reliance.....	do.....	— Spalding.
Wyoming & Colorado mine.....	Wyoming & Col.....	Cleary.....	Tony Goeseeman.

MINE-INSPECTION LAWS OF ALASKA.

ORIGINAL ACT.

The following act (Session Laws of Alaska, 1913, chap. 72, p. 274) relating to mine inspection in Alaska was passed by the Territorial Legislature on April 30, 1913:

An Act to divide the Territory into mine inspection districts; to establish the office of mine inspector; to prescribe the duties, powers, qualifications and compensation thereof; to regulate the operation of mines in the Territory of Alaska; to provide for the health, and safety of mine workers in the Territory; to declare the violation of any of the provisions hereof a misdemeanor and prescribing punishment therefor.

Be it enacted by the Legislature of the Territory of Alaska:

SECTION 1. As soon as practicable after the passage of this act, and not later than the first day of April, nineteen hundred and fourteen, the Governor of the Territory of Alaska shall appoint one qualified person to be inspector of mines; such inspector shall be known as the Territorial Mine Inspector, and he shall be under the supervision and subject to the instructions of the Federal mine inspectors now appointed as provided by law.

No person shall be appointed a mine inspector who shall not be a citizen of the United States, and who has not been a resident of the Territory of Alaska for at least three years. Every person appointed to the office of mine inspector must be theoretically and practically acquainted with mines and mining in all its branches, and he shall hold his office for the period of two years unless sooner removed by the Governor. No person shall hold the position of inspector of mines while an employee or officer of any company or corporation. Each inspector of mines shall devote his entire time and attention to the duties of his office, and the salary of each inspector shall be \$2,500 per annum, and he shall be allowed his actual and necessary traveling expenses while in the performance of his duties under the provisions of this act and such salary and expenses shall be paid monthly.

SEC. 2. It is the duty of the Territorial mine inspector to visit the mining sections assigned to him by the Federal mine inspector or the governor of the Territory, and examine as many mines therein as practicable, inspect their workings, timbering, ventilation, means of ingress and egress, and the means adopted and in use for the preservation of the lives and safety of the miners employed therein. For this purpose the inspector at all times shall have access to any mine and all parts thereof. All mine owners, lessees, lessors, agents, operators, managers, or superintendents must render such assistance as may be necessary to enable the inspector to make the examination. When upon

such examination any mine or portion thereof is found to be in an unsafe or insecure condition, the inspector shall at once serve a notice in writing upon the owner, lessees, lessors, agent, operator, manager, or superintendent thereof, setting forth the nature of the defects which render such mine unsafe or insecure and the point or place in such mine where such defect exists, and requiring the repairs necessary to remedy such defects to be made within a specified time, and, if in his judgment the circumstances so require, he shall forbid the operation of such mine or portion thereof as has been declared unsafe or insecure, save and except for the purpose of making the repairs necessary for the purpose of remedying such defects and making such mine safe and secure for the laborers employed therein.

SEC. 3. Whenever the inspector of mines receives a complaint in writing signed by three or more parties setting forth that any mine is dangerous in any respect, the inspector must, as soon as possible, visit and examine such mine. Every such complaint must set forth the nature of the danger existing at the mine and (when) the time and cause of such danger was first discovered.

SEC. 4. If upon such examination the inspector of mines ascertains that the mine is from any cause in a dangerous condition, he must at once notify the owner, lessor, lessee, agent, manager, operator, or superintendent. Such notice must state fully and in detail in what particular manner such mine is dangerous or insecure, and require all necessary changes to be made without delay, for the purpose of making such mine safe and secure for the laborers employed therein; and in any criminal or civil proceeding at law against the party or parties so notified, on account of loss of life or bodily injury sustained by the employee subsequent to the service of such notice and in consequence of a neglect to obey the inspector's requirements, a certified copy of the notice served by the inspector is prima facie evidence of the gross negligence of the party or parties so complained of. If the owner, lessee, lessor, agent, operator, manager, or superintendent of any such mine shall neglect or refuse to cause the repairs necessary to remedy such defect to be made within a reasonable time, or shall refuse to cause work to be stopped when so ordered, such party or parties shall be prosecuted criminally by the inspector.

SEC. 5. Whenever a serious or fatal accident occurs in any mine it is the duty of the person in charge thereof to immediately notify the inspector of the mining inspection district wherein such mines is located, in the quickest manner possible, and upon receiving such notice the inspector of mines must, if possible, at once repair to the place of accident and investigate fully the cause of such accident, and whenever possible to do so the inspector shall be present at the coroner's inquest held over the remains of the person or persons killed by such accident and testify as to the cause thereof, and state whether, in his opinion, the accident was due to the negligence or mismanagement of the owner or person in charge. If the inspector can not be immediately present in case of a fatal or serious accident occurring, it is the duty of the owner or person in charge of the mine to have written statements made by those witnessing the same and sworn to. In case no person was present at the time of the accident, then the verified statement of those first present after the accident must be taken and such statement must be forwarded to the inspector. If after making such investigation the inspector deems the facts warrant it, he may prosecute criminally the owner, lessee, lessor, agent, operator, manager, or superintendent of the mine in which such accident occurred.

SEC. 6. Each inspector of mines must make a monthly report to the governor, and the report must give a statement of all mines visited by him; a statement of all the accidents that have occurred in his inspection district which have occasioned serious injury or resulted fatally, together with the nature and

cause of such accidents. Such report shall also contain such additional information as the governor may require, and must set forth the result of the inspector's labors.

SEC. 7. The provisions in this act do not apply to mines in which less than six people are employed.

SEC. 8. Any person or corporation failing to comply with any of the provisions of this act is punishable by a fine of not less than \$25 nor more than \$500, or by imprisonment in the Federal jail not less than ten days nor more than six months, or by both such fine and imprisonment.

AMENDMENT.

The following amendment (Session Laws of Alaska, 1915, chap. 71, p. 130) was passed by the Territorial Legislature on April 29, 1915:

An Act to repeal section eight of chapter seventy-two of the Session Laws of Alaska for nineteen hundred and thirteen entitled, "An Act to divide the Territory into mine inspection districts; to establish the office of mine inspector; to prescribe the duties, powers, qualifications, and compensation thereof; to regulate the operation of mines in the Territory of Alaska; to provide for the health and safety of mine workers in the Territory; to declare the violation of any of the provisions hereof a misdemeanor and prescribing punishment therefor," approved April thirtieth, nineteen hundred and thirteen, to amend sections one and two thereof; to add sections eight to thirty, inclusive, prescribing further duties and powers for Territorial and Federal mine inspectors; and to repeal all acts and parts of acts inconsistent or in conflict herewith.

Be it enacted by the Legislature of the Territory of Alaska:

SEC. 1. That section eight of chapter seventy-two of the Session Laws of Alaska for nineteen hundred and thirteen, entitled "An act to divide the Territory into mine inspection districts; to establish the office of mine inspector; to prescribe the duties, powers, qualifications, and compensation thereof; to regulate the operation of mines in the Territory of Alaska; to provide for the health and safety of mine workers in the Territory; to declare the violation of any of the provisions hereof a misdemeanor and prescribing punishment therefor," approved April thirtieth, nineteen hundred and thirteen, be, and the same hereby is, repealed.

SEC. 2. That section one (1) of said chapter seventy-two of the Session Laws of Alaska for nineteen hundred and thirteen, be amended by striking out in lines five, six, seven, and eight thereof the words "and he shall be under the supervision and subject to the instruction of the Federal mine inspectors now appointed as provided by law."

SEC. 3. That section two (2) of said chapter seventy-two of the Session Laws of Alaska for nineteen hundred and thirteen, be amended by striking out in line three (3) of said section the words "Federal mine inspector or the." Provided, however, that the exercise of the jurisdiction of the Territorial mine inspector or inspectors shall be subject to the revision and review of the governor of the Territory of Alaska, and that through him an appeal may be taken subject to the review and revision by the United States Bureau of Mines.

SEC. 4. That the following sections be, and they are hereby, added to said chapter seventy-two of the Session Laws of Alaska for nineteen hundred and thirteen:

"SEC. 8. Definitions: That the term 'mine,' when used in this act, shall include any and all parts of any mine within the Territory, and any mining plant or equipment connected therewith underground or on the surface, which contributes, or may contribute, to the mining of ore, coal, or other metalliferous or nonmetalliferous mineral product.

"That the term 'operator,' when used in this act, shall mean the person, firm, association, company, or corporation in immediate possession of any mine or mining claim, or accessories thereof, as owner or lessee thereof, and as such, responsible for the management and condition thereof.

"That the words 'excavation' and 'workings,' when used in this act, signify any or all parts of a mine excavated, including shafts, tunnels, entries, winzes, raises, stopes, open-cuts, and all working places, whether abandoned or in use.

"Sec. 9. Jurisdiction of inspectors: That the jurisdiction of the mine inspectors shall cover all branches of mining, shaft sinking, tunneling, quarrying, and dredging, and the machinery incident to the reduction of ores or the treatment of the material: *Provided, however,* That such jurisdiction shall apply only to the safety of the workers employed in such mining, shaft sinking, tunneling, quarrying, and dredging, and around machinery incident to the reduction of ores and treatment of the material: *Provided, however,* That the Territorial mine inspector shall have no jurisdiction under this act over coal mines to be worked under lease from the United States Government.

"Sec. 9½. The Federal mining inspector or inspectors shall have authority in the absence of the Territorial mining inspector to enforce the provisions of this act. In all such cases the Federal mining inspector shall report in detail to the governor of the Territory of Alaska all cases wherein he has invoked the aid of the Territorial mine inspection act.

"Sec. 10. Statistical records: That the mine inspector shall distribute blank forms, requiring statistics of accidents, labor and production, or such other information as the governor may require, which shall be filled in and returned to the mine inspector's office, to be made and used under the same conditions and restrictions as now required by the United States Geological Survey and the United States Bureau of Mines by the persons in charge of mines or mine workings, on or before the thirty-first day of December each year.

"Sec. 11. Sanitation: That in any working mine the inspector may require a sufficient number of portable, water-tight privies to be provided for the underground employees, such privies to be taken to the surface and cleaned every twenty-four hours.

"Sec. 12. Guards for dangerous machinery: That any owner, lessee, agent, operator, manager, or superintendent of any mine, mill, tunnel, shaft, quarry, or metallurgical works, wherein laborers are employed or machinery used, shall provide and maintain reasonable safeguards for all cogs, gearing, belting, shafting, couplings, set screws, conveyors, vats, rolls, and machinery of other or similar description, which it is practicable to guard, and which can be effectively guarded with due regard to the ordinary use of such machinery and appliances and to the employees therefrom, and with which the employees of any such mine, mill, tunnel, shaft, quarry, dredge, or metallurgical works are to come in contact while in the performance of their duties; and if any machinery or any part thereof is in a defective condition and its operation would be extra hazardous because of such defect, or if any machinery is not safeguarded as provided for in this act, the use thereof is prohibited, and a notice to that effect shall be attached thereto by the employer immediately upon receiving notice of such defect or lack of safeguard, and such notice shall not be removed until such defect has been remedied or machine safeguarded as herein provided.

"Sec. 13. Safety of shafts:

(a) That when any shaft is sunk on any vein or ore chute, or body of ore, or any shaft sunk for the purpose of mining ore, a pillar of ground shall be left standing on each side of the shaft, of sufficient dimensions to protect and secure the same, and in no case shall stoping be permitted up to or within such

proximity to the shaft as to render the same insecure, until such time as the shaft is to be abandoned, when said pillar may be withdrawn.

(b) All abandoned mine-shafts, pits, or other excavations, endangering the life of man or beast, shall be securely covered or fenced.

"**SEC. 14. Ladderways:** That every shaft, winze, raise or incline of steeper slope than forty degrees from the horizontal, and deeper than forty feet, through which men are obliged to travel, shall be provided with a ladderway. Suitable ladders, or footways, shall be provided to connect floors or sets in stopes and other places requiring communication in mines. Every mine shall have in addition to any mechanical means of ingress or egress, at least one proper ladder or footway communicating from the lowest workings of the mine to the surface.

That permanent ladderways, used for ascent or descent of persons in the mine, shall be sufficiently strong for the purpose demanded, and shall be firmly fastened and kept in good repair. In a vertical shaft, the mine inspector may, at his discretion, by an order in writing, direct that the ladder shall be inclined at the most convenient angle which the space in which the ladder is fixed allows, and every such ladder shall have a platform at intervals of not more than fifty (50) nor less than twenty (20) feet. The said platforms shall be closely covered, with the exception of any opening large enough to permit the passage of a man, and shall be so arranged that by no means could a person fall from one ladder through the opening to the next ladder. This shall not apply to placer mines.

"**SEC. 15. Passageways** around shafts, guard rails for shaft stations, etc.: That all stations or levels shall have a passageway around the working shaft so that crossing over the hoisting compartments may be avoided. All sumps shall be securely planked over. At all shaft stations a gate or guard rail must be provided and kept in place across the shaft, except when cage, skip, or bucket is being loaded; but this prohibition shall not forbid the temporary removal of the gate or rail for the purpose of repairs or other operations, if the proper precautions to prevent danger to persons are taken. This shall not apply to underground placer mining.

"**SEC. 16. Hoisting of men or materials.** (a) **Hoisting engineers:** That no person addicted to the use of intoxicating liquors or drugs, or under the age of eighteen years, shall be employed as a hoisting engineer.

(b) **Hoisting machinery:** That all hoisting machinery, using steam, electricity, air, gasoline, or hydraulic motive power, for the purpose of hoisting from, or lowering into, mines of employees and materials, except shafts not exceeding three hundred (300) feet in depth, shall be equipped with an indicator, said indicator to be placed near to and in clear view or hearing of the engineer. This indicator must be in addition to the marks on the rope, cable, or drum.

(c) **Rate of hoisting speed:** That it shall be unlawful to hoist men out of or lower men into a mine at a speed greater than eight hundred (800) feet per minute. When in running his engine at a speed greater than eight hundred (800) feet per minute, an engineer violates the express order of his employers, he, the engineer, shall be subject to the penalty herein provided.

(d) **Ropes or cables used for hoisting:** That all ropes or cables used for hoisting purposes shall be of approved quality and manufacture: *Provided*, That in shafts and winzes of over two hundred (200) feet in depth only wire ropes or cables shall be used for hoisting purposes.

(e) **Construction of headframes:** That all headframes, where men are hoisted in places where more than twenty-five (25) men are employed, shall be so constructed as to allow at least twenty-five (25) feet above the hoist

landing stage in which the cage, skip, or bucket can travel freely in case of an overwind. The mine inspector may grant permission for the use of any headframe, erected previous to the enactment of this law, which does not comply with the above conditions. This shall not apply to placer mines.

(f) Safety cages: That it shall be unlawful for the operator of any mine to permit the hoisting or lowering of men in any shaft deeper than three hundred (300) feet, unless an iron-bonneted safety cage, equipped with gates or doors, of sufficient size and strength to prevent a man falling onto the timbers, be used: *Provided, however,* That this provision shall not apply to shafts in the process of sinking. Every cage must have overhead bars of such arrangement as to give every man on the cage an easy and secure handhold. Every cage or skip used for hoisting men must be provided with a safety catch or catches of sufficient strength to hold the cage or skip with its maximum load at any point in the shaft in the event that the hoisting cable should break. The inspector must see that all cages and skips are equipped in compliance with this paragraph, and that on all cages the safety catches are kept well oiled and in good working condition.

(g) Hoisting buckets, guides, and crossheads: That all vertical shafts, more than two hundred (200) feet in depth, from which hoisting of men is done by means of buckets, must be provided with suitable guides, and in connection with the bucket there must be a crosshead traveling upon these guides. The height of the crosshead shall be at least one and one-half times its width. If the crosshead be a type that is not secured to the hoisting rope, a stopper of a design approved by the mine inspector must be securely and rigidly fastened to the hoisting rope at a suitable point above the rim of the bucket.

(h) Persons riding in cages or buckets: That the number of persons permitted to ride on the deck of a cage, in or on a skip or bucket, shall be determined by the mine inspector, and in no case shall more than the number of men permitted by the mine inspector be allowed to ride on the deck of such cage, or in or on such bucket or skip. No person shall ride on a cage or in or on a skip or bucket when loaded with rock or ore, unless the owner or operator of the mine shall have provided double-deck cages, in which case the employees may be permitted to ride upon the deck not occupied by such tools, timbers, or other materials.

(i) Riding on loaded cage: That no person shall ride upon any cage, skip, or bucket that is loaded with tools, timber, powder, or other material, except for the purpose of assisting in passing these through the shaft.

(j) Lowering cage to bottom of shaft: That in no case shall a cage, skip, or bucket, or other vehicle be lowered directly to the bottom of a shaft when men are working there, but must be stopped at least fifteen (15) feet above the bottom until the signal to lower further is given by one of the men at the bottom of the shaft: *Provided, however,* That this section shall not apply to shafts less than fifty (50) feet in depth.

(k) Protection from falling material in shaft: That persons engaged in deepening a shaft, in which regular hoisting from any upper level is going on, shall be protected from the danger of falling material by a suitable covering, sufficient opening in the covering being left only for the passage of the bucket or other conveyance used in sinking operations.

(l) Bulkheads between two working crews: That in shafts, winzes, or raises where two or more crews of men are working, one crew above another, there shall be a bulkhead between the two crews of men strong enough to stop any tools or other material that may fall from the men working above, and only the cage, skip, or bucket compartment be left open.

(m) Plugs for windlasses: That windlasses and whims in use in mines shall be provided with suitable plugs or other reliable devices to prevent running back of the bucket or other conveyance used.

(n) Hooks for buckets: That no open hooks shall be used with buckets when hoisting, but some form of safety or shackle hook, approved by the mine inspector.

(o) Hoistmen: At any mine, where men are hoisted by mechanical means, a hoistman, charged with the care of such hoist, shall be kept on duty thereat at all times when men are underground, and he shall be charged with the actual hoisting of the men.

" SEC. 17. Mine outlets:

(a) Divided shafts: That at every mine where a single shaft affords the means of ingress and egress to the persons employed underground such shaft, if more than three hundred (300) feet deep, shall be divided into at least two compartments, and one of the compartments shall be set aside for a ladderway, which must be equipped as hereinbefore provided. Whenever such single shaft shall be covered by a building not absolutely fireproof the ladderway shall be securely bulkheaded at a point at least twenty-five feet below the collar of the shaft, and below this bulkhead, if the shaft is situated on a hillside, a drift shall be driven to the surface; if the shaft is situated in a level country the drift shall be driven to a safe distance beyond the walls of the building, but in no case less than thirty (30) feet, and from there a raise shall be made to the surface. This raise shall be equipped with ladderways, and it, together with the drift connecting with the main shaft, shall be kept in good repairs and shall afford a safe escape in case of fire.

(b) Fireproof doors near mouth of adit: That every adit on which the mouth is covered by a house or building of any kind shall be provided with a fireproof door near the mouth of the adit that can be closed from the outside of the building by means of a pull wire or cable, so as to keep the gases or combustion from entering the mine in the event that fire destroys the building at the mouth of the adit.

(c) Covering for sumps and other openings: That existing winzes, sumps, and all other openings in the floor of a drift or stope must be kept covered by a substantial hatch, or planking, or provided with guardrails.

" SEC. 18. Stationary lights:

(a) Stationary lights to be provided: That lights shall be provided during working hours at all stations in vertical and incline shafts during the time while in actual use, and also at all stations in levels where hoisting or hauling is effected by machinery, and also at night at all working places on the surface.

(b) No candles to be left burning: That no candles shall be left burning in a mine, or any part of a mine, when the person using the candle departs from his work for the day.

" SEC. 19. Accumulation of water:

(a) That when advancing a drift, adit, level, or incline toward a working suspected to be filled with water, a bore hole must be kept at least ten feet in advance of the breast of the drive and also, if necessary, in directions laterally from the course of the drive. Such additional precautionary measures shall be taken as may be deemed necessary by the mine inspector to obviate the danger of a sudden breaking through of water.

(b) That no raise shall be allowed to approach within ten feet of any portion of a winze or a stope in which there is a dangerous accumulation of water.

(c) That in every mine where, in the opinion of the mine inspector, there is danger of a sudden inrush of water such additional raises, drifts, or other work-

ings shall be constructed as are necessary to insure the escape of workmen from the lower workings, and all sumps and places for the storage of water in mines shall be so constructed as to prevent leakage, as far as possible, and insure the safety of the men working below the same.

(d) That it shall be unlawful for any operator to impound water within any mine in which men are working below the water so impounded in such a manner as to endanger the safety of such men unless such water be impounded by a dam or dams or wall or walls approved by the mine inspector.

"SEC. 20. Minors not to be employed: That boys under the age of sixteen years shall not be employed underground in a mine.

"SEC. 21. Intoxicated persons not allowed in mines: That no intoxicated person shall be allowed to enter a mine. Nor shall any intoxicated person be allowed to remain in any mine. Nor shall any intoxicating liquors be taken, or allowed to be taken, into any mine.

"SEC. 22. Visitors: That strangers and visitors shall not be allowed underground in any mine, unless accompanied by the owner, official, or employee deputized to accompany them.

"SEC. 23. Ventilations: An adequate amount of ventilation shall at all times be produced, so that all mine workings and the roads to and from such workings shall be free from any offensive gases. The air must be in such a state that a light will burn freely at all times in any working portion of the mine. That all old timbers shall be as soon as practicable taken from the mine, and shall not be piled up and permitted to decay underground.

"SEC. 24. Signal system:

(a) That each mine shall adopt its own set of station signals, and that such station signals shall be given before the hoist or lower signals provided herein; that the engineer shall not move the cage, skip, or bucket unless he understands the signal.

(b) That the official code of signals herein provided for and the station signals adopted or to be adopted by each mine shall be posted at all hoist engines in plain sight of engineer at the collar of each shaft and at every station, the letters or figures thereon to be not less than one-half inch in height.

"SEC. 25. Code of signals: That the following shall be the official code of signals for underground work throughout the Territory:

One bell—hoist.

One bell—stop, if in motion.

Two bells—lower.

Three bells—hoist men, run slow.

Two slow bells—lower very slow.

Three slow bells—hoist very slow.

Four bells—blasting signal. This is a caution signal, and if the engineer is prepared to accept it he must acknowledge by raising the bucket or cage a few feet, then lowering it again. After accepting this signal an engineer must be prepared to hoist the men away from the blast as soon as the signal (one bell) is given, and must accept no other signal in the meantime.

Six bells—skip or cage call. To be followed by the station signal, when the skip or cage is desired.

Nine bells—danger signal. Followed by the station signal, calls cage to that station. This signal takes precedence over all others, except an accepted blast signal.

"SEC. 26. First aid to the injured:

(a) That a supply of articles suitable for first-aid treatment shall be kept at every mine, the list to include a book of instructions, antiseptic gauze, carbolated vaseline, carbolic acid, tablets of bichloride of mercury, linseed oil, bandages, soap, wash basin, and towels or the equivalents.

(b) That at every mine or metallurgical works where there are poisonous gases or solutions there shall be kept in a conspicuous place the proper antidotes, properly labeled, with the instructions for their use.

“SEC. 27. Explosives:

(a) That no inexperienced man shall be allowed to use high explosives, except for the purposes of instruction, and then only under the supervision of a competent person.

(b) That no explosives shall be used in any mine unless there is plainly printed or marked on every original package containing such explosives the name and place of business of the manufacturer and the strength and date of manufacture of such explosive.

(c) That no explosives shall be stored in any mine: *Provided, however,* That this shall not be construed to prevent the operator of any mine from keeping sufficient explosives within such mines as may be required within the next twenty-four hours.

(d) That such temporary supply shall not be kept in any place within such mine, where its accidental explosion would cut off the escape of the miners working therein.

(e) That no open lights shall be taken into the magazine or held where the spark could fall in the box, or on to the explosives.

(f) That no caps or oil shall be stored in any powder magazine.

(g) That all magazines shall be placed at a safe distance from the entrance to a mine or public highway.

(h) That no iron or steel tamping bars shall be used.

(i) That if after blasting and before work is resumed a charge is known to have missed fire or cut off, the same shall not be withdrawn, but shall be blasted, and that no drilling shall be done on the same working face where there is so known to be a missed or cut-off hole containing explosives, until the same has been blasted, provided that where a missed or cut-off hole is discovered in the face of a stope after blasting, no drilling shall be done within ten feet of said missed or cut-off hole, but drilling may be done at a distance of ten feet or more from such missed or cut-off hole.

(j) That a suitable house, in which to thaw explosives shall be built separate from the other mine buildings and shall be equipped with suitable apparatus for thawing explosives, approved by the mine inspector. The key or keys to such powder magazine shall be held by some competent person or persons who shall be responsible for the distribution of the powder, and shall be under the direction of the mine foreman or some other careful and experienced person. Whenever deemed necessary by the mine inspector, suitable apparatus for thawing explosives shall also be provided for use in the mine and shall be under the immediate charge of the mine foreman or some other careful and experienced person.

“SEC. 28. Machinery:

(a) That all boilers, used for the generation of steam, shall be equipped with a safety valve, water gage and water glass, and shall be inspected at least once every year by a competent person and a written report of such inspection shall be kept, and such boilers shall be hydraulically tested, annually, to a pressure exceeding the working steam pressure by 40 per cent.

(b) That all gears shall be covered or inclosed.

- (c) That all exposed set screws shall be countersunk or covered.
- (d) That all belts, through which it is necessary for employees to travel, shall be suitably protected so as to comply with the provisions of section 12.
- (e) That all keys on shafting shall be covered or protected by railing.
- (f) That shafting in exposed places shall be protected by railing or housed.
- (g) That hoisting engines shall be equipped with brakes of sufficient strength to hold the loaded cage or skip at any point in the shaft.
- (h) That all hoists shall be equipped with efficient indicators.
- (i) That hoisting ropes shall have at least three turns around the drum when the cage or skip is at the lowest point in the shaft.
- (j) That no ropes shall be used for hoisting men, when 10 per cent of the wires in any running foot are broken.
- (k) That hoisting ropes shall have a factor of safety not less than five, to be calculated by dividing the breaking strength as published in the manufacturer's tables by the sum of the maximum load to be hoisted, plus the weight of the rope, plus 10 per cent of such values, to take into account the shock of striking and of starting and stopping.
- (l) That haulage locomotives shall be equipped with gongs or whistles.

"Sec. 29. Laws to be accessible: That it shall be the duty of the superintendent of any mine within the provisions of this act to keep at all times in the office of said mine, and in the timekeeper's office thereof, in an accessible place, and subject to inspection by all workmen and persons interested in the same, at least one printed copy of this act.

"Whenever the approval, order, or direction of the mine inspector is provided for or contemplated in this act, the same shall be in writing and signed by the mine inspector, and a duplicate of the same delivered to the person or corporation operating said mine; and wherever any apparatus is now installed in any of said mines or workings, and the approval of the mine inspector is contemplated or provided for in this act, the said approval shall not be construed or deemed necessary until after such mines shall have actually been inspected by such mine inspector and until a written order or approval or disapproval shall have been signed by the mine inspector and a copy thereof delivered to the owners or operators of the mine.

"Sec. 30. Penalty for violations: Any persons or corporations failing to comply with any of the provisions of this act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than \$50 nor more than \$1,000 or be imprisoned in the Federal jail for a period of not less than thirty days nor more than one year, or punished by both such fine and imprisonment, at the discretion of the court."

Sec. 5. All acts and parts of acts inconsistent or in conflict with the provisions of this act are hereby repealed.

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